Summer No. 44 — November, 1984/ $2.50*

EARTH GARDEN

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(solar electric systems)

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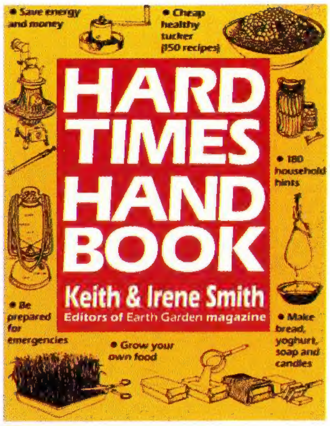
• Save energy and money
• Cheap healthy tucker (150 recipes)
HARD TIMES HAND BOOK
Keith & Irene Smith
Editors of Earth Garden magazine
• 180 household hints
• Be prepared for emergencies
• Grow your own food
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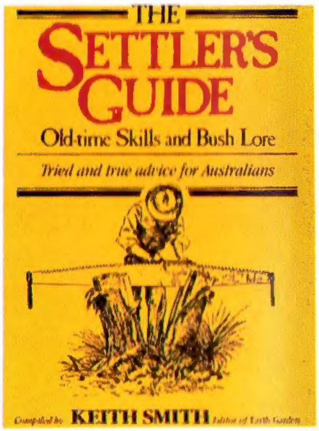
The Settler's Guide

Old time skills and bush lore

Compiled by Keith Smith

Nelson, Melbourne, 1983 (second printing), large format paperback, 176 pages, illustrated, index. Price $15.95 posted.

Pioneer a bush block from 'go' to 'whoa'. How to clear, fence, square a gatepost, whitewash, build a slab hut, a rammed earth house or timber windpump, harness horses and select and care for tools like axes, adzes, planes, mauls, crosscut saws and scythes. Tried and true advice from *The Agricultural Gazette* of NSW, 1890-1910.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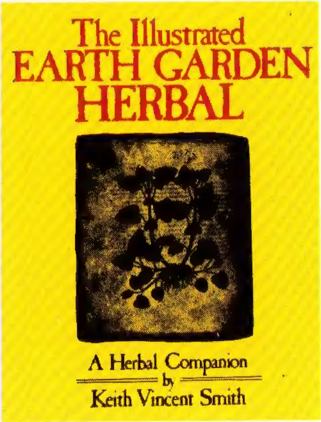

The illustrated EARTH GARDEN HERBAL

Compiled by Keith Vincent Smith

Nelson, Melbourne, 1978, large format paperback, 157 pages, 120 woodcuts, index. Price $9.00 posted.

A quality book, with text and illustrations based on the classic 15th century Herbals. Covers 40 herbs, with a modern commentary, growing tips for Australia and medicinal uses. Dioscorides (60AD), Pliny the Elder (77AD), John Gerard (1597) and Nicholas Culpeper (1653) speak of these beautiful, aromatic plants with delight.

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A Handbook of Self-sufficiency in Australia
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SMALL-SCALE LIVESTOCK
LIVING THE GOOD LIFE
FOOD: PRESERVING AND EATING
BUILD YOUR OWN HOUSE
MAKE IT YOURSELF
ALTERNATIVE ENERGY
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Edited by Keith and Irene Smith

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- Or buy the 'big packet' of Earth Garden 1-44. Order form, page 58.

Earth Garden, started in 1972, is the original Australian journal of self-reliance. It is intended as a friendly forum of practical ideas, shared knowledge, sources and alternatives.
It's about putting a roof over your head, growing your own food, using alternative energy and surviving — and thriving — in the city or the bush and the inner changes which follow when you are in tune with nature.

Earth Garden is published each quarter in mid February, May, August and November. Annual subscription is $10.00

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Let us lead you up Earth Garden's path to the good life!

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EARTH GARDEN 44

The cover

Background: Sunlight becomes electricty, as it strikes these 'second generation' polycrystalline silicon solar cells manufactured by Japan's Kyocera Corporation and distributed in Australia by Amtex Electronics.
Top right: Peter van der Wyk (Peter Pedals) in his outdoor 'office' at Nimbin, NSW, runs his NEC computer on 12 volt DC power from an Arco M-82 solar module (see ***Computers,*** page 55).
Left: This weekender in the bush has lights, radio and TV run from Solarex solar panels supplied by ***Solar Charge*** of Gardenvale, Victoria.
Back cover: This 12 volt DC incandescent globe next to a leadlight window lights up the toilet at Jolanda and Bob Rich's mudbrick home at Moora Moora, near Healesville, Victoria.

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Beans for fish

Port Augusta, SA
By Gordon Bohlin

Our family moved into this house 18 months ago. No water, except rain, had been used in the yard for seven years previously. Consequently, we had our own private dust storm.

All around the house the ground was down to plain clay.

When it rained, a white encrustation of magnesium and salts would cover the area like snow a few days after the pools of water dried.

"Well, you won't have to worry about mowing the lawns, *ever*", joked my workmates at my new job. It sounded so final, all-in-all a depressing picture.

To make things worse, the equinoxial gales whipped up magnesia and dust from vacant paddocks and a salt lake from across the road and blew it through the *Cyclone* wire front fence (even the galvanised iron fence posts, not very old, were going rusty), where Rae, my wife, picked it up, helped it through the house, and put it in the backyard.

Then the north wind picked it up and deposited it in the house again. There it waited, but not for long, for Rae to transport it to where she felt it would no longer get the wanderlust.

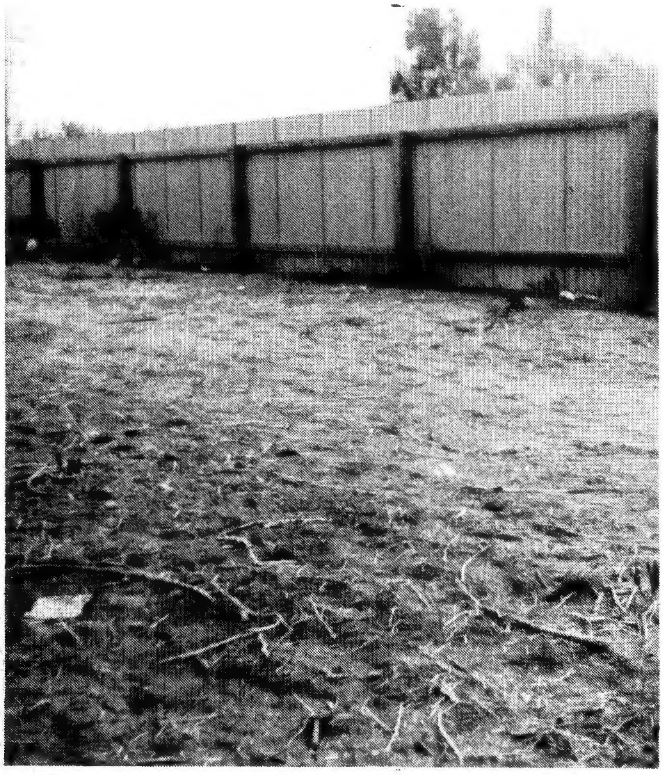
Rae and myself were at the point of despair when I discovered a copy of *Earth Garden No 2* in a second hand bookstall heap. It was the best 50 cents I have ever invested. After reading it from cover-to-cover I became motivated.

After some searching, I found an old, abandoned gypsum mine. I filled up a 6ft x 4ft trailer and brought it home, spread it over the whole clay area, and watered it in. I discovered that the local horse stables had a problem disposing of their manure. My impression was that this rich source of free fertiliser would surely have been absorbed long ago by long-time locals. Not so, it seems it was shunned like the plague. So began a long and tedious task, with car and trailer, carting tonnes of stable manure and equivalent loads of red drift sandhill sand to mix together with the manure on my days off.

As if by instinct a *Grosse Lisse* tomato plant came up on its own in the middle of the yard. This triggered the need for, first, another load of manure, then the building of a small hothouse over this happy plant, to see it through the winter. I constructed this from 4 inch x 2 inch hardwood scrounged from the local tip, a few bolts and nuts, wire netting (also from the tip) and new plastic sheeting (quite cheap), held down by battens.

That Grosse 'Lizzie' was trained all around the hothouse. On cold days Rae would often find me sitting in the hothouse reading, just keeping Lizzie company, or having a little glass of wine with her to celebrate the ripening of another huge tomato. Lizzie was teetotal and drank nothing but water, sometimes with chlorine, which gave her a hangover. For many months Lizzie kept Rae and myself, our three children, and the neighbours in fresh tomatoes.

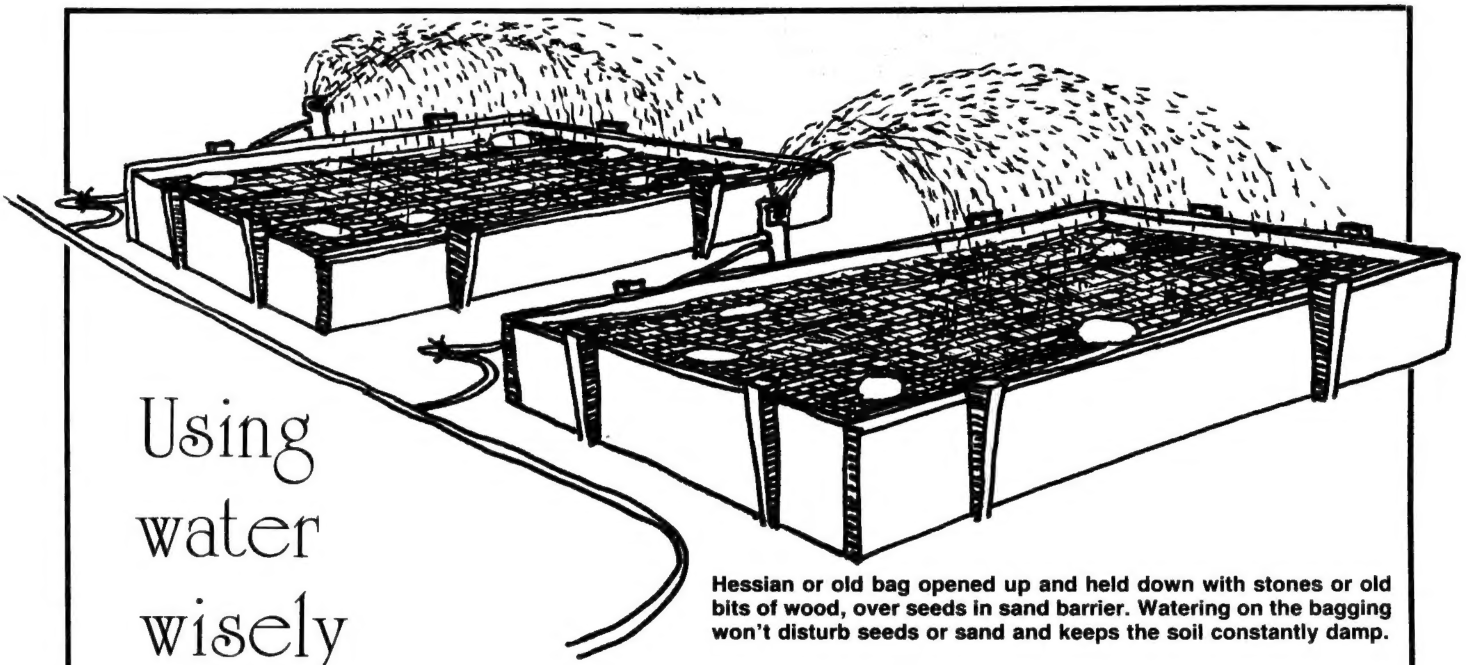
Meanwhile the rest of the garden plants were competing quite well. In the hot weather pumpkins of unbelievable



BEFORE: Desolation — as it was when we first moved to our home in Port Augusta.

NOW: Rae looks at the banana palm and Tracy thins carrots while Howard and Ross weed.

Using water wisely



Hessian or old bag opened up and held down with stones or old bits of wood, over seeds in sand barrier. Watering on the bagging won't disturb seeds or sand and keeps the soil constantly damp.

By Gordon Bohlin

Water is expensive here and it is full of chlorine. Due to the chance of these amoebic meningitis things getting up our noses and killing us, they really dope the water up. I've never heard of anybody recovering from this business, so we must live with it.

In summer, the water is so hot that you cannot stand under a shower late at night. The pipeline which comes to us at Port Augusta, from Morgan on the River Murray, becomes a huge hot water collector on its 200 mile journey (I'm not metric yet — my old waggon has a real speedo). With the water so hot we can fill the bath during the day and all have our wash in the evening.

Before sunrise, when the water is usually cold and the chlorine is gone, we used to bucket it out to selected parts of the garden. I have a small pump now.

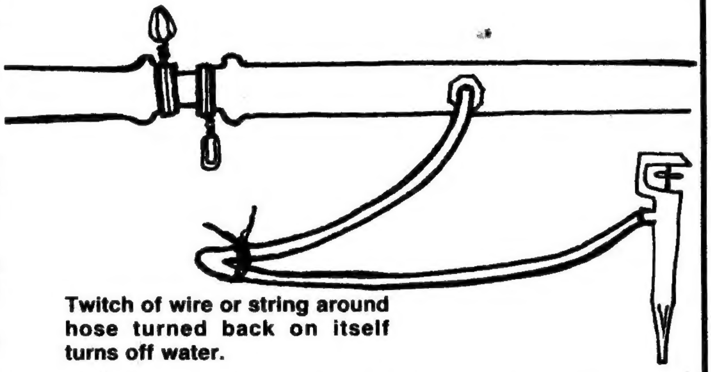
The most economical way of getting water out onto the garden, to my thinking, is flexible polythene pipe, with smaller hoses coming off the sides to small butterfly-type sprinklers. I use **Bluebirds** (made in Australia), as the jets can be changed to vary the quantity of water, micro-jets for small garden beds screw in where they are needed and drippers may be used under trees.

The individual sprinklers can be turned off on their own just by doubling the hose back on itself and tying it with twine, string or wire. All the hoses can be moved, the sprinklers are on spikes and can be moved aside to dig or replant the garden, allowing a good deal of flexibility as to where you plant things.

A word of warning — water at night. If your water is as hot as ours, the push-together joints or T-pieces, or at filter or tap, should be wired down, as the hose gets hot and some of your garden gets extra water and some gets none if the pressure and hot water break the joint.

Make your beds to the shape designed by the water thrown out by your sprinkler. Nobody cares what shape your garden is when they are getting a bunch of fresh spinach given to them from the patch — and you are the one paying for the water.

Water turned off this way saves having several taps. You don't need to pull hoses around and damage the plants and the black polythene hose is not hurt by the sun. Be careful though, as the first water from the hose during the day can be close to boiling in hot weather.



Twitch of wire or string around hose turned back on itself turns off water.

Here's a tip I found useful when my pumpkins were standing tall and the sprinklers ended up under the vine leaves and water distribution was restricted. I filled an eight-inch pot with sand and spiked the sprinkler into it. The sand held it steady and above the leaves. The whole area then gets its fair share of water.

Mulching

Our oat straw mulch stops evaporation from the garden beds during the day, so the water isn't wasted. So often I hear people complaining in summer that their plants are drooping. If they would only look after the roots and keep the ground cool it wouldn't happen. Even vegie peelings around the plants in your front yard won't look like vegie peels for long and they will also keep the ground cool and moist.

My Youngest Horticulturist called me to see the empty cup of an orange skin face down on the ground. "Dad, there is a whole farm of animals under here", he said. I looked and found it a writhing mass of worms, with other insects in the soil underneath feeding on worm droppings. What more can you want in a garden?

size were lying around everywhere. We shared these with our neighbours because any one pumpkin was too much for one family.

The carrots, I thought, would surely be forked from the fresh manure, but I must have got their soil ratio right. They turned out *beaut.* I planted carrot seed thinly, in a half inch of pure red sand spread over the top of the sand-manure mix and covered the bed with a hessian bag opened out, kept damp, and weighed down around the edges. You will find that this method brings up all seeds quickly. The layer of sand acts as a barrier which prevents weeds coming up at the same time.

An extra bonus from the horse manure is the oaten hay which comes up and is easily pulled up or dug in green, or left to stand to protect plants from winds. Let the oats mature and keep the grain for poultry, or even sprouts. The dry straw makes magnificent mulch around any plants. It holds moisture in the ground, especially when the local water is so heavily chlorinated. This allows us to wait for a cool change, when there is not so much chlorine injected into the water supply pipelines.

We had a good crop of garlic, four different varieties, which kept us going for a year and is now replanted. I don't mind what my breath smells like, I don't have to kiss everybody. Of course, the easiest way to stop your friends smelling your garlic breath is to give them some to eat, then they can't smell your breath over their own!

Garlic is better than vitamin C to keep colds at bay, I've found. Talking of vitamin C, my capsicums are producing heaps. It's nice to sit out in the garden and chew a fresh capsicum like an old apple, straight from the bush (but minus the seeds). Prune capsicums and the bush will produce for years.

This earth that I saw so dead and cold (or hot, depending on the day's temperature) 18 months ago has become an earthworm-riddled living part of our family. Each time we sit down to a meal, there is a part of it at our table. There is the chutney from Lizzie, horseradish freshly minced (including the tears), on meat, or just plain bread and butter (or margarine, I'm not fussy).

Think of the beautiful fresh peas, straight from pod to pot and the sweet corn fresh from the plant and not the freezer, or wilted from the market shelf. Have you ever tried a spud, white from the earth, put in a pot and boiled before the skin gets a chance to oxidise and get that vague yellowish look? Put them straight into a bucket of water as you dig them out.

Ross (left) and Howard inspect the mushrooms.

I was told not to waste garden space with beans. "It's impossible to grow beans at Port Augusta." Everyone says so. I had to try anyway. Up went a trellis and almost as fast, up came my Purple Kings.

"Oh yeh", said Everyone, "they will grow alright but you won't get any beans, and then the mites will get 'em anyway."

So after dark out I went with my pyrethrum spray. I wasn't worried that Everyone would see me, because he was sitting down watching *Dallas* on the TV and sucking on a tube of beer. Besides, all these mites get out on the job in the early evening. That's why insects all gather round the verandah lights and come in through the window screens that you haven't yet fixed. You don't see them in the day.

All the Australian animals seem to be nocturnal, even me, I'm a shift worker.

Well one Saturday, Tracy, my Overseer, was out in the early morning, chewing a carrot fresh from the ground, while Howard, the Youngest Horticulturist, was seeing if last week's sowing had emerged. Ross the Boss came up excitedly, shouting "Dad, Dad, you've got beans!"

By picking the beans young and regularly it wasn't long before the freezer had a comfortable padding of beans inside. Just before the frost came I packed up a paper parcel of beans and gave it to Everyone. Without opening it, he said "I didn't think you would find time to get out of your jungle to go fishing."

"I don't", I replied, "but you do, so you can replace that with fish."

Not only did he replace them, but he gave me all fillets, so fresh you could almost imagine them still jumping out of the water. "See," he said, "I filleted the fish, but you didn't slice the beans." Well I almost took up fishing.

After eating fish from the supermarket and then eating Everyone's fish it was like eating my homegrown asparagus compared to eating asparagus out of a tin. I shouldn't be eating mine yet, but with the amount of manure and the size of the crowns I planted, I feel I am justified.

Anyway, Everyone keeps us in fish while I keep Everyone in vegies. He even uses my worms for bait when he goes fishing down the Murray. It proves there is something in my garden for Everyone (and he enjoys it).

This morning I picked 11 mushrooms for breakfast. They came up two or three days ago. I had left them to open up, to drop the spores or whatever it is that keeps them reproducing. Cut mushrooms off rather than pulling them from the earth. It has been said that pulling them breaks the *mycellium* threads that they grow off.

Boy, did they taste good, cooked in butter and milk, thickened and served on toast with pepper and salt. *Yum!* Rae and myself are grateful that the children have not developed a taste for these dainty morsels that come so unexpectedly.

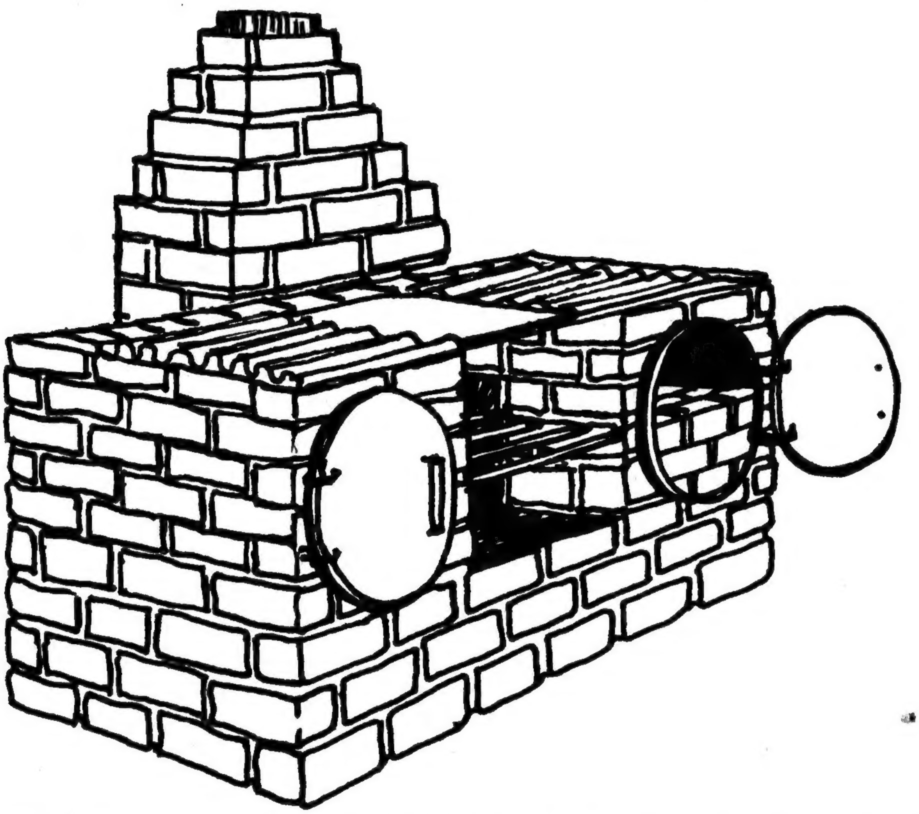
By giving us mushrooms off the old watermelon patch, which was the site of the first load of manure that we brought into the wilderness, the soil seems to be communicating with us, and the mushrooms are the 11 words:

Thank you for your loving care from every plant and worm.

And thank everyone of you for sharing our joy of living in what was once a wilderness. I will write again to let you know if I have defeated these horrible equinoxial gales.

Cheerio for now, Gordon.

An outdoor cookstove



By Shane Rowley

This combination oven and barbecue hotplate will allow you to cook a meal or make bread for one or two people — or for a crowd of 50 if needed. I used one like this with great success in the Army.

As it is roughly constructed, it isn't intended for use inside the home, but it would be ideal for a lean-to, where the heat may be kept out of living quarters, or it may be used as a temporary stove while clearing land or setting up your home in the bush.

You will only need four basic building materials:

secondhand or broken bricks
2 x 44 gallon drums
sheet of corrugated iron
mud

The illustration shows you the general idea. The firebox is in the middle with an oven made from 44 gallon (or other size) drums on either side. Where it differs from the usual barbecue is that hot air is made to flow over the top of the drums, down the other side, and through holes in the brickwork until it comes out in the chimney area, where the chimney updraught will keep it going. This is achieved by allowing air to flow through holes in the inside walls and the inner chimney wall.

Mud is used as mortar between each course of bricks and as a render both inside and outside on every part of the stove. If heat cracks joints, simply re-render the outside of the stove wherever it needs it. Most cracks will appear near the stove drums because of expansion and contraction.

The chimney is an extension of the firebox, so its size is, in effect, governed by the width you make the firebox. A guide to this is the size of the materials being used, for example 1½ bricks wide is probably plenty for the width of the firebox and will allow the chimney to be tied in by alternating bricks to cover joints as in a normal brick wall.

Although I made the chimney all brick, the chimney walls could be narrowed as soon as they are higher than the hotplate to take either a metal pipe or flue or a tin can. Number 10 beetroot cans or similar would be ideal, just use a pair of pliers to open the top end slightly.

There are two things to bear in mind here. The higher the chimney, the better the fire will draw, but 3ft (1 metre) above the hotplate is plenty. You shouldn't make the chimney too thin, or it won't draw.

A sheet of corrugated iron will do as the hotplate top. If you want to fry or grill, a small barbecue plate placed over the middle section will do the job. If you go to the expense of getting a steel plate made for the hotplate, take the opportunity to add a couple of removeable cooking rings (like those on fuel stoves), so you can put in a saucepan or two.

Refinements include doors for the ovens, which may be made from the cut-out drum lids attached with wire.

Yes, there are a few hours of work involved in building the oven-hotplate, but a large pot of meat or vegetables left to simmer slowly while you get on with your chores should be an ample reward. After using the stove a few times you'll find that you will be able to bake bread or damper that will 'blow your mind'.

I'll be happy to reply to any queries you may have about building an outdoor cookstove if you write to me with an SAE.

Shane Rowley, 75 Kingsway Avenue, Rankin Park (Newcastle), NSW, 2287.

It only happens to me

Cast of characters: Vic Calthorpe, his faithful dog Tess and Land Rover.

Mt Glorious, Qld
By Vic Calthorpe

Having purchased a ¼ acre block of land right on the top of Mt Glorious, some 20 miles north of Brisbane, I decided to make it look like mine by dumping all my earthly possessions on it! I had been scrounging for over five years (and I still am) in the hope that I would find the right place to live and use it all for building.

So, here I was, halfway to the completion of my dream (See: *Working on another dream, Earth Garden 31).* My assets: Still young at 38, a huge pile of timber, a Land Rover and that dream.

I had no previous building experience (unless you can count five chicken sheds). I'm a butcher by trade, but that industry had long since collapsed and I have not worked in it for six years. My only income was a casual job as a cleaner at the local school. So this place had to be built with a minimal amount of money, not much experience and, I realised later, not too much brain!

My skills lay in gardening. That I *am* good at. So the first thing I did was to clear some of the best land nearest the road for a vegie garden. The idea was that while building, I would at least get a good feed. Clearing was hard during the long, hot summer days as the land was covered with lantana, bracken fern and tall wild tobacco trees, the roots of which had to be towed out with the Rover. The bracken was effectively mowed into submission.

I grew potatoes, beans and cabbage the first year and some comfrey for the fowls living in a makeshift shed. I caught rainwater from a sheet of iron angled into an old cast-iron bath, until one morning when I caught two rough-scale snakes sunning themselves on the edge of the tin.

I then built a tin shed with a lean-to kitchen near the building site. I decided to build the house at the back of the block because the soil ran into clay and that would leave the best red volcanic soil for growing. I planned to use wooden stumps for my foundations. They are cheap, strong and last for years. I read in a Forestry manual how ironbark stumps removed after 30 years in sea water were still sound. I had an advantage also that white ants do not live in red soil.

I started digging some 40 holes and the weather was *hot.* Not a drop of rain had fallen for ages and the clay soil was packed down like a road. I even had bees landing on me, seeking the moisture running down my back. The soil would slip endlessly down the shovel each time I tried to lift it up. After a week of this solid hot work, the holes were completed. I had dug over 100ft of holes and, boy, did I ache! By the time the month was out Queensland had recorded its hottest March since 1915. *It only happens to me.*

After just a few day's rest when my spine was finally straightening, it poured with rain. All the holes were filled to brimming and were full of dead bush rats and large warty toads. I took another rest. On returning, the holes were drained, re-dug and the dead animals composted.

I managed to obtain some telegraph poles for only 60 cents a foot, all I had to do was to go and get them. The longest poles were 12ft and were loaded into my 6ft x 4ft trailer by crane. As I wound my way home in the late afternoon, dodging the bush roads and the police, I realised that it was getting dark and I was only halfway up the winding mountain road. I was about six miles from home when, taking a bend fast to gain speed for the next hill, a tyre burst on my trailer. I figured it would be quicker to keep driving rather than try to change the tyre for a soft spare one.

I put the Land Rover into 4-wheel-drive and first gear. After the first mile the heavy load of six poles had shucked off the tyre completely, then the tube and, shortly after, the wheel rim was flattened out. I arrived at my land at 1 am and decided to try to unhitch the trailer by the light of the moon and return the following day with help. No way! I realised that the sheer weight of the logs on the towbar could not be lifted and I remembered the crane had to load them. By 3 am I finally levered off the last log. "Do I really want to build my own house?" I thought as my old dog Tess tucked me into bed. *It only happens to me!*

I collected the 40 stumps over the next few weeks. Some of them came from demolished houses and were usually free on removal. I put my first row of stumps up, only to find that they were softwood and would only last five years before rotting. I had to cut them down and dig eight more holes. I cried a lot that week.

All this was climaxed by Queensland having the wettest May on record.

At this point there was some good news. A guardian angel appears. Not in person, just in voice, and was to stay for the duration of my building and continued scrounging.

I had read an article in *Earth Garden* about preserving stumps by placing the ends in a container of boiling tar. Next day while scrounging in town my beady eyes spotted a 44 gallon drum of bitumen lying in the kerbside, slowly leaking, having obviously fallen off the back of a truck! It was just what I wanted, but I couldn't lift it. I started to cry at the thought of having to leave it behind.

I arrived back at Mt Glorious the next week to find the drum still lying there, in a bigger pool of bitumen. The owner whose house it was slowly engulfing came over and asked me if I wanted it (I was probably standing with my mouth open not believing my luck that it was still there). The next day some of the contents were poured into a smaller container and boiled over an open fire. I painted all the stumps four times each and poured the remainder into the holes.

After the stumps were all erected and straightened a local Forestry worker cut them level with the aid of a water level. I nailed on the stump caps which I had picked up at a demolition site for free, along with some anchor bolts, which would be used later.

By July I was ready for the 5in x 2in bearers. This is the next heaviest job after stumps. A friend arrived to help me lift the heavy timbers onto the stump caps, which ranged from 18ins to 11ft off the ground. These were then joined over the stumps with metal plates and bolts. By lunchtime, my friend had developed a headache and left. This was the first and last time anybody offered me help on a voluntary basis, even though they would all ask periodically "How's your house going, Vic?"

I finished the rest of the bearers knowing that if I didn't there wasn't any money to pay somebody else to do it. I painted them with a mixture of sump oil and creosote. The Saturday edition of *The Courier Mail* revealed the address of an old home being pulled down in town. Always try to buy building materials on the site as the price is almost double back in the demolisher's yard due to cartage, denailing and sorting. You will often get a bargain if you arrive on a rainy day, due to lack of business, also after the wrecker has finished and before the builders arrive on the site. Another small benefit is that if the house was old then so is the garden, usually. Many botanical refugees live and bloom in my garden which otherwise would be under a concrete slab.

I purchased there 20 floor joists, 25ft x 4in x 2in. Being a complete novice at this building lark I was never fully aware of the weight of all these building materials. After safely tying the joists on the roof of the Land Rover, it was not until I hit the first pothole in the road that I noticed the roof moving up and down above my head! Within a mile or so of dodging holes, the roof had developed a distinct V-shape. The load never moved again, but when it started to rain it looked as if my dog and I were driving out from under a waterfall.

Putting in the floor joists was a relatively simple job, just placing them on the bearers 18ins apart and nailing with triple grips for stability. These were also painted with preservative.

Next decision was whether to build the frame or lay the floorboards. I decided that, having no flat land to work on, I would put the floor down first. I could then also use the area under the floor for storage and shelter.

I was told about the relative of a friend who dealt in new reject timber and told if I were to pay him a visit I would find his prices quite reasonable. I still needed floorboards, weatherboards, framing iron and roofing iron. He gave me a very good price, but as I only had $500 saved he took that and offered me a job as a labourer to his carpenter, who was about to spend two weeks erecting a house in the bush. I jumped at this chance. In that time away I had a go at laying a floor and nailing chamfer boards. When I returned, I drove home with a load of floorboards and chamfers and later with an assembled house frame and roofing iron. They were all new, but were defective — twisted, split or warped — in some way.

Many hours of fun lay ahead.

The completed house in its bush setting.

It took me two weeks to cut and nail the whole 50ft x 20ft floor. This included using a pair of ancient floor cramps (Convict types!) and trying to straighten out many twists and warps. In the end it didn't look too bad for a butcher! No sooner had I finished cutting and nailing by hand in the hot sun when it rained and blew for a week. The plastic covering was blown to shreds and then when it finally did stop raining, the boards buckled in the hot sun making the floor look like a huge cracker biscuit. *It only happens to me!*

Previously I had bought a truckload of floorboards for $40.00, a bargain I thought, from a demolisher with terrible 'flu who told me that if I pulled them all up myself I could have them cheap. I did and it took a day of sweating in that hot Queensland sun. Later I found the boards were ancient and brittle and they finished up in my wood stove. Another lesson learnt.

By this time it was nearly winter and the weather up here, 2000ft above sea level was becoming cold at night and sleeping in my tin shed was becoming a health hazard. Sleeping with only my Army boots removed and my dog Tess on the bed, the temperature was often around freezing. During the day it was ideal for working and in the following weeks I built my first 1000gal tank stand, harvested my first potato crop and later hired a Bobcat to level a small area at the front and back of the house.

I was now out of money and although I had materials, I did not have the knowledge to proceed further, nor any extra materials to cover any attempts I might make which went wrong. Looking back, I think I was at my lowest ebb. There sat the materials, but because I had no cash for tradesmen and no helpers, I was just frustrated.

Spring arrived and I took to the garden with a vengeance. I always feel the urgency of spring and I can pick its presence immediately. I left the frustrations about building the house behind me and let all my energy and enthusiasm pour into my natural gifts. I harvested zucchini, beans, corn and tomatoes by the bucket-load. I established a vegie garden 40ft x 70ft, wired sides and over the top, planted a herb garden with 30 different kinds of herbs and around the edge of the lot 20 different fruit trees. Energy surged back from my usual supply, the garden. I can never say enough about gardens. They are magic. I also built a chicken shed and cemented the inside of an old rainwater tank from the tip to collect my fresh water.

I decided to build another shed to live in because the tin one was so cold. I would build a wooden shed set into a bank of red soil, out of the way of the westerly winds. I built it from packing cases thrown on the local tip by the Electricity Board during some of their activites on the mountain. It looked good and I moved in. The rats and mice moved in. They thought it was warmer and cosier too.

The rains came again. Water poured down the bank, under the wall, under the bed, across the floor and out under the door. *It only happens to me!* I decided then and there that I had to make giant steps in building my castle. My dog and I elected to spend the rest of my meagre savings on employing a builder acquaintance who in normal times would not touch a project like this with a barge pole, except that his trade was in the middle of a slump. After looking at my secondhand materials, my job so far and me, he reluctantly agreed to turn up the following Monday morning. He did turn up on a Monday as it happened, but it was three Mondays later. He left me to dismantle the assembled house frame as most of it was buckled and would have to be recut and nailed. During this time it rained again and the mice moved into everything, including my bed.

Mike the builder arrived one sunny Monday, armed with *Vegemite* sandwiches, his two mates and a nailing gun. The frame was cut and nailed and up in a day. This was the greatest achievement so far! All that scrounging, all that waiting, hoping and dreaming was suddenly forgotten. There standing in the fading sunlight was 'my home', an everlasting memorial to St Victor (patron saint of scroungers). I was elated!

The days that followed were long, hot and busy as I tried to encourage the workers to be faster, as only I could see my dreams becoming visible. The workmen would be glad to see the back of 'this shed' and after 10 days they had had enough and so had my savings. The roof was on. It could rain as much as it liked — and it did! I creosoted the entire frame and rafters. Have you noticed that even after a week you can still smell creasote on your hands as you fall asleep at night?

This brought 1981 to an end and we had the hottest day since 1893.

I started 1982 by laying over 100 concrete blocks in the form of a wall just in front of the house. In front of that I dug a drain which diverted the rainwater away from the house. All the blocks came from the tip and I spent many hours sitting down chipping off mortar and cleaning them up. My piles have cleared up now! This was my first attempt at drainage and block walls and was quite successful.

The chamferboards were easy once the first one was up and level. The work was in the carrying, cutting and painting the 'backsides' of the boards. After the first week I was pretty fast at nailing 'em up and my thumbs were beginning to heal nicely.

I needed some windows next and my guardian angle, who had been resting, stepped in and guided me to a houseful of casement windows en route to the tip. I rang my builder friend again and persuaded him with some difficulty to come and show me how to put in one casement so that I could copy that for the rest. Mike came for just half an hour, put in one window and drove off. It was so fast that I didn't quite catch it, so I decied to put in all the windowsills. Sills are worth scrounging as they are really expensive to buy new. Eventually I put in a single window and it worked. It actually opened and closed too. I thought "Great, here I go." But as I looked around I saw that the rest were either double or triple windows.

Windows are fairly easy provided the frames are square. Never nail the frames completely home as some movement helps later when the windows go in. Try to have your windows opening to catch the breezes.

Shortly afterwards I wrapped the house completely on the inside walls with *Sisilation* paper, which separated the rooms and made it more homely. I even put my old wicker chair where the kitchen would be and made a cup of tea while I stared out through the holes in the walls.

With the weather still warm through the long summer evenings I worked long and hard, especially as no money was available, just physical effort and determination. I managed to complete all the windows, outside doors, barge moulds and guttering down one side.

The 1000gal tank filled and my first plumbing effort produced a single cold water tap over the sink. By the time winter arrived, I was two years older (into my mid-life crisis), but gaining more confidence in myself and in what I would attempt. In this time all the chamferboards went up and I was moving in to face the first winter in a home I had built myself. My Forestry Department contact supplied me with a power pole for $30 and I exchanged six hours of mowing for a power box. Another $100 had the power pole up and the electricity connected. I ran an extension lead into the house and became suddenly 'civilised'. With this extra aid the work increased at night.

As we entered another cold winter the rats and mice began clearing my books and records at 20 hectares a day. My garden was now two years old and producing well and the local wildlife was really enjoying their new source of food.

I still needed somewhere to keep warm, so I decided to build a fireplace in my sitting room. During my scrounging days I had amassed 3000 bricks from tips and demo sites. I had also made the acquaintance of an old Yorkshire stonemason named Joe. He had retired, but offered to help me build a fireplace and chimney. I designed one with an oven, the same as I had seen back home as a child. I bought an old *Crown* gas stove, removed the legs and top part and suspended it on iron bars above the fireplace, then built around it and up to the chimney. I can bake bread, warm clothes and dry firewood in this stove. The whole thing cost $200 to build. Once again, I was delighted to see some more of my dreams coming true.

I then worked on sealing one room completely for warmth, cooking and eating, obviously the kitchen. I advertised for a combustion stove and was offered one by an old lady who bought it in 1947. It was in good condition. I got some new firebricks and a new jacket for the back of the firebox. Instead of buying a stainless steel flue, I bought a length of steel piping from a scrap metal yard for $12. The whole stove, parts and repair, cost only $100. Stoves are easy to work on after removing the top plate.

I also tried tiling around the fireplace and the combustion stove and these jobs were successful. There are so many 'handyman' products on the market these days that you only have to ask. I found that making friends with one of the hardware assistants was a good thing, especially to let them know that you're trying to have a go yourself and that you're not a millionaire.

Many times during the winter the wind would blow piles of leaves under the roof and settle them on the bed. My daughter Maressa would look like one of the 'babes in the wood' lying asleep covered in leaves.

When we finally lit the stove on the first cold night, it was magic. We cooked cakes, biscuits and puddings and burnt our knees. The stove is certainly the heart of our home.

Now in 1984, four years later, the house is still not completed. It looks good and, most of all, feels good. If you ask me if I would do it all again, I would say "Not bloody likely", but that is to say, at least not that way. That's what life teaches us.

If you are contemplating building your own 'castle', whatever the size, shape or your resources — have a go! You will come out of it with a really good feeling about yourself. If you are having second thoughts and need advice, please write and I'd be pleased to give you some encouragement.

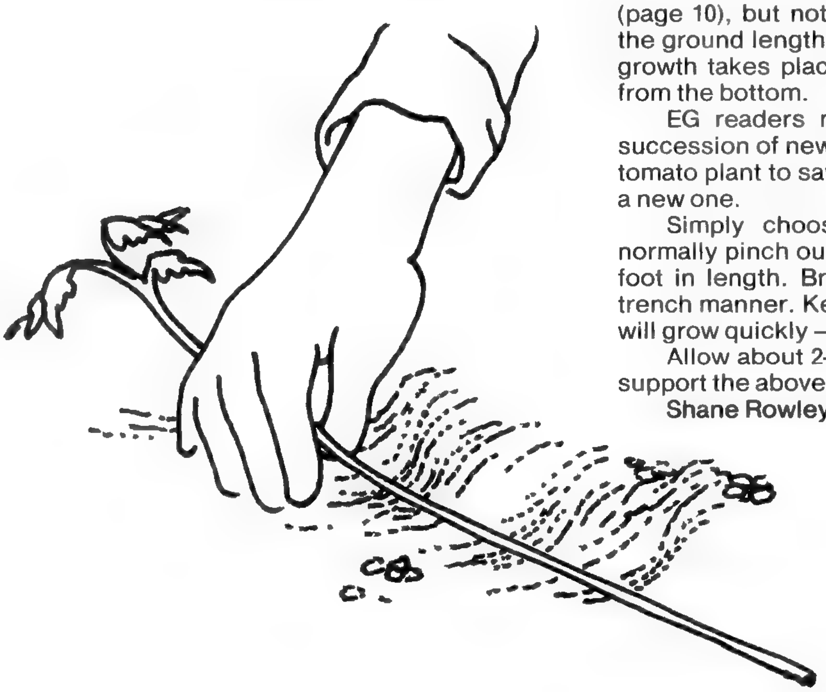
On the practical side, here is a list of hints:

1. Get a set of *Earth Garden* magazines.
2. If possible, build with a companion.
3. Have a decent, reliable vehicle.
4. Keep a photographic record (for your own encouragement).
5. Start a vegetable garden.
6. Read Abbie Heathcote & Neil Douglas' book, *The Book of Earthly Delights.*

Finally, if you are a woman and on your own, don't let size and strength discourage you. Get started and just watch what happens! If anybody is in the area and would like to drop in for a cuppa, please do. I need ideas too!

Vic Calthorpe, PO Box 42, Mt Nebo, Qld, 4520.

TRENCHING TOMATOES



Tomato trenching was mentioned in your review of Dick Raymond's Joy of Gardening in **Earth Garden 42** (page 10), but not explained. It means laying plants in the ground lengthways when transplanting, so that root growth takes place over the full length instead of just from the bottom.

EG readers might be interested to know that a succession of new plants can be taken from any healthy tomato plant to save buying seeds or plants or growing a new one.

Simply choose a few of the laterals that you normally pinch out and allow them to grow to about one foot in length. Break off at the base and plant in the trench manner. Keep moist for a few days and the roots will grow quickly — you have a new tomato plant!

Allow about 2-3 inches of soil and mound up soil to support the above ground part of the plant.

Shane Rowley, Rankin Park, NSW.

Photos courtesy of The Gladstone Observer.

Sid Goodman checks his new solar electric unit, with the family's timber home in the background.

Life at the Lazy G.

Mt Larcom, Qld

By Marlene Krapkat

"If I buy you a horse each, can I sell the TV?"Sid Goodman got a chorus of "yeses" to that question and years later the family looks back on that day as the turning point that led them away from their suburban lifestyle.

Sid, with his wife Lola, and children Veronica 21, Ken 24, Brad 19, Kylie 18 and Tanya 13, soon after moved from the central Queensland city of Rockhampton to a 1000 acre property near Mt Larcom, 85 kilometres south. There they spent the next decade literally carving a home out of the virgin wilderness.

The Goodmans were forced off their dairy farm, west of Rockhampton, in the 1970s and had been uncomfortable with city life. Mr Goodman never really accepted the eroding economy of the time which had caused the demise of many farms, so when city life and its restrictions got too much he moved his family back into the bush and began developing a lifestyle that escaped as many of the problems of urban life as possible.

As the family developed their methods of subsistence living they came up with the idea of sharing it with others and providing an additional source of income. The family set up the *Lazy G Holiday Ranch,* where visitors can now take a serene ride through beautifully rugged foothills at the base of Mt Larcom and also take a lesson in alternative living.

Living at first in a small caravan and a hut, the family set to work building their home using stone foundations quarried from their own hills and timber from the strong mountain trees.

The house took six months to build. It was a huge job, snigging the logs by horsepower to a sawmill powered by a 40 year old tractor. The 12 x 6 metre house has an undeniable pioneering character, with a large kitchen-dining area, enclosed verandah and an upstairs sleeping loft for the children. The verandah wall panelling is varnished spotted gum.

The family built two small log cabins and two larger bunkhouses over the next 3½ years to accommodate visiting trail riders. The five pony mares and a stallion, who started the project with the family, were mated and their offspring broken in and specially trained for trail work.

It was no accident that Sid had selected Welsh Mountain-Arabian cross ponies for his children. Like the parents, the progeny are hardy and attractive and don't need special feeding or attention.

During the four years it took to build the ranch, the family survived virtually without an income. "If you can keep your overheads down to rock bottom, your income doesn't matter that much," Mr Goodman said. With the whole family working to provide vegetables, bread, meat, power and fuel were generated on the ranch.

An orchard of about 50 trees, ranging from oranges, lemons and mandarins to bananas and Queensland nuts (macadamias), was established with irrigation from a bore on the property. A small wheat crop provided truly natural ingredients for wholewheat bread. Chickens and a few milking cows provided eggs, milk and meat.

Kerosene, at that time much cheaper than it is now, was used in hurricane lamps for household lighting. Animal manure was used to produce methane gas as an extra power source. After modifications, Mr Goodman was able to run the family land cruiser on charcoal gas.

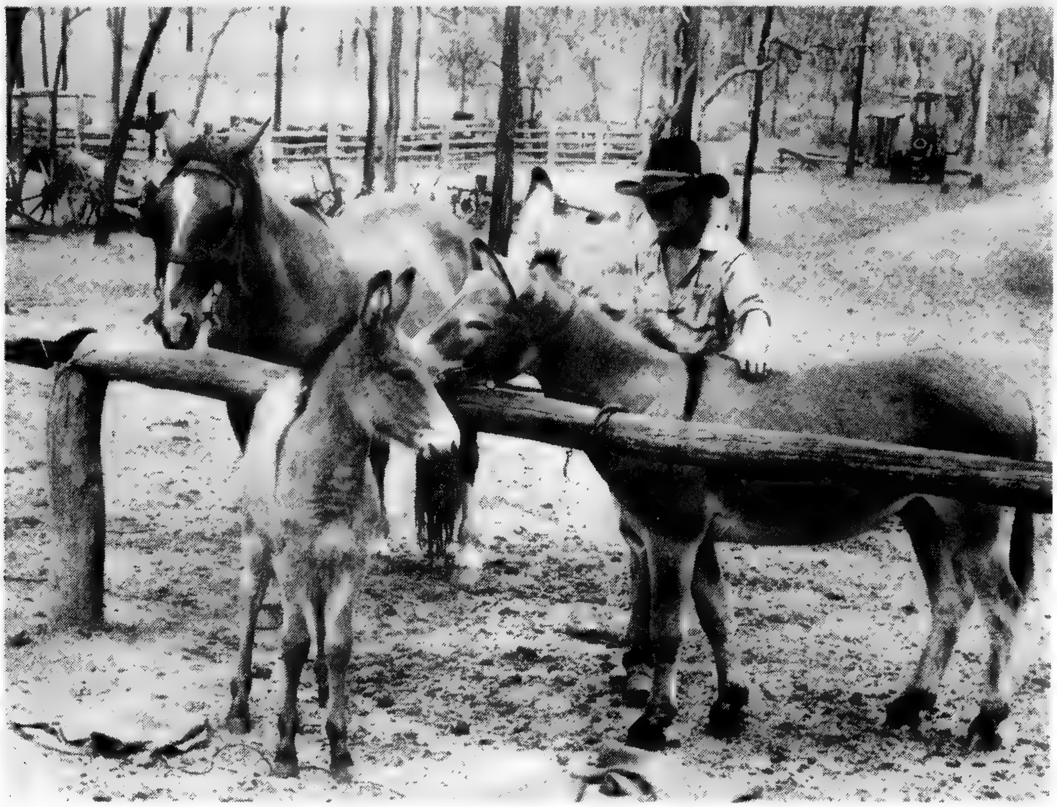
The ranch opened for business in 1979 and is now a well-known attraction in the region, a popular place for childrens' church and recreational camps. Groups and visitors now come to the *Lazy G* from throughout Central Queensland and some from Brisbane.

The number of horses has grown steadily, with about 50 head now roaming the property. Sid and his sons often find work on the cattle properties in the district as horsebreakers and stockmen. A rodeo arena is well advanced as the next building project on the ranch. Once finished, the Goodmans will offer their skills as riding teachers with a school which will include rodeo riding.

The latest livestock venture is mule breeding, with the secondary purpose of providing mule power for cultivation. Clydesdales, while strong, have not been able to take the Queensland heat, but a draughthorse-donkey cross would retain the strength of the horse and gain the hardiness of the donkey. One young mule has been born and Sid Goodman estimates he will have a working pair in about three years.

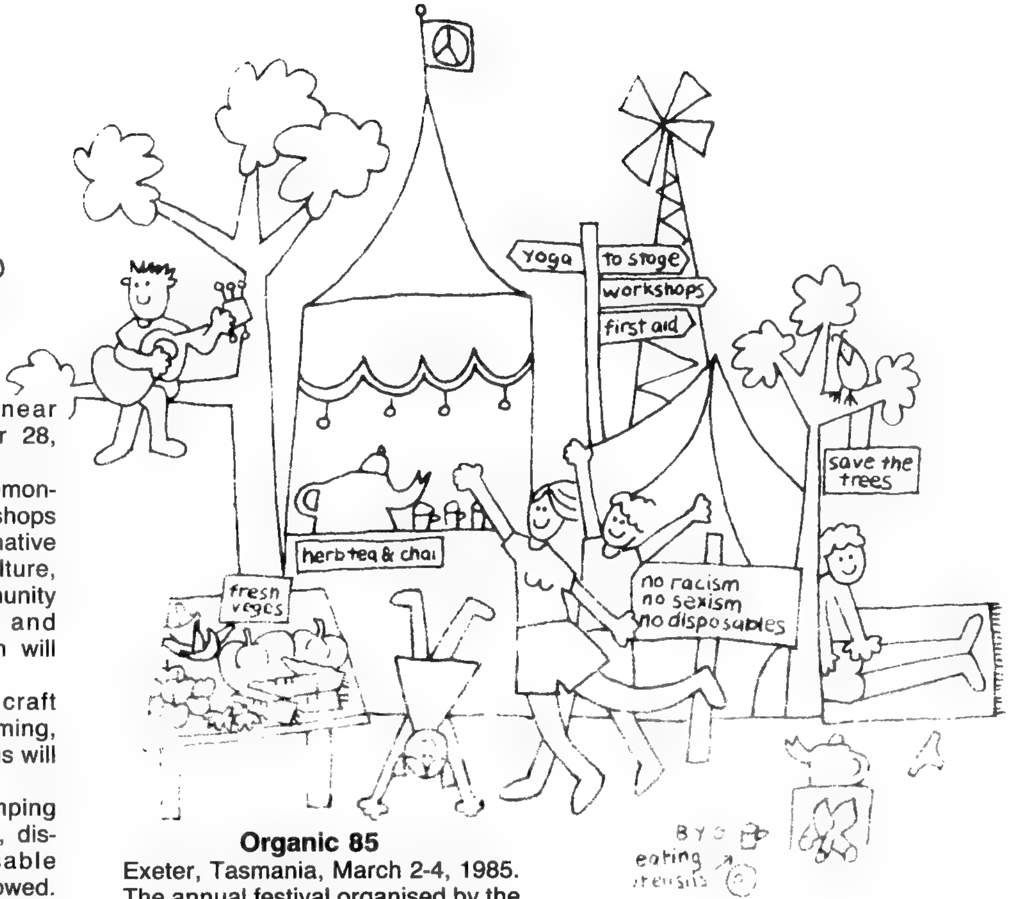
The most recent innovation at the ranch has been the installation of solar electricity. The family now pays absolutely nothing for power, saving about $400 on their earlier kerosene bill. Mr Goodman is continuing his research into alternative fuel sources and is a member of the Darling Downs Alternative Energy Association. He describes hydrogen as the most promising energy resource of the future. His work involves using hydrogen gas to power cars, by taking hydrogen from water via electrolysis.

Mr Goodman's background in mechanical engineering has been an advantage in the family's subsistence living, but he believes it is something within the reach of anyone with enough conviction. "It hasn't been easy. A lot of people are amazed that we've turned our hands to so many things. But I'd like to think that anybody could do it," he said.



Bradley Goodman, 19, with Jack the donkey, his offspring Luke the mule and the mother, a gentle draft mare.

Festivals



Confest for peace

Down to Earth Confest, near Wangaratta, Victoria, December 28, 1984-January 2, 1985.

The theme is peace, with demonstrations, discussions and workshops on that worthy topic and on alternative technology, building, permaculture, massage, natural healing, community politics, self management and women's issues, each of which will have their own village.

There will be a food and craft market, music, dancing, swimming, sharing and games. Dr Jim Cairns will be there.

Bring your own shelter, camping and sleeping gear, music, cups, dishes and cutlery (no disposable takeaways), but no pets are allowed. Cars must be left at the car park. Gate price $35 for adults, $25 concession, children under 16 free, or adults $20 for purchase before November 30. Enquiries to DTE, 2nd floor, 285 Little Lonsdale Street, Melbourne, Victoria, 3000. Phone (03) 663 1561.

Solar Village. Gloria Scott, a member of the Alternative Technology Association, who is helping to organise the Solar Village, tells us the accent will be on "Solar — not Nuclear" and will include onsite electricity generation and hot water, pedal power, recycling and mudbrick making. Contact Gloria at Friends of the Earth (03) 419 8700 if you can contribute to displays or workshops.

Sky to Earth Confest

Glenlyon Reserve, near Daylesford, Victoria, December 7-10, 1984.

A festival of the occult, with bands, stalls and workshops, lectures and displays on alchemy, astrology, herbalism, meditation, numerology, permaculture, shamanism, tai chi, tarot, alternative technology and yoga. Gate price $20, or $15 pre-registration from PO Castlemaine, Victoria, 3450. Presented by Unicorn Star Enterprises, this gathering is not connected with the Down to Earth Confest.

(Information from Doug Richards)

Organic 85

Exeter, Tasmania, March 2-4, 1985.

The annual festival organised by the Organic Farming and Gardening Society of Tasmania will be held at Exeter, 26km north of Launceston in the Tamar Valley over the March long weekend.

There will be continuous exhibitions and demonstrations, including spinning, weaving and shearing sheep and goats and a department of Agriculture exhibit of biological pest controls.

Speakers include TV personality Peter Cundall and pharmacist Ken Atherton, who will discuss diet, allergies, vitamins and minerals. David Stephen will be at the demonstration garden to answer questions on organic growing methods while John Lemon will explain water turbines and electric generators for use on small streams.

There is plenty of camping space and you will be able to buy good wholesome food as there will be a total fire ban during the festival. Entry is $8 per person per weekend, or $3 per day. Camp and caravan sites $3 per night. Children under 16 are free.

Camping enquiries: (003) 94 4048 between 6-7 pm. General enquiries: (003) 963369 or 947369. Or send SAE to Mrs G. Davis, RD 540 Winkleigh, Tasmania, 7251.

(Information from Fred Berry)

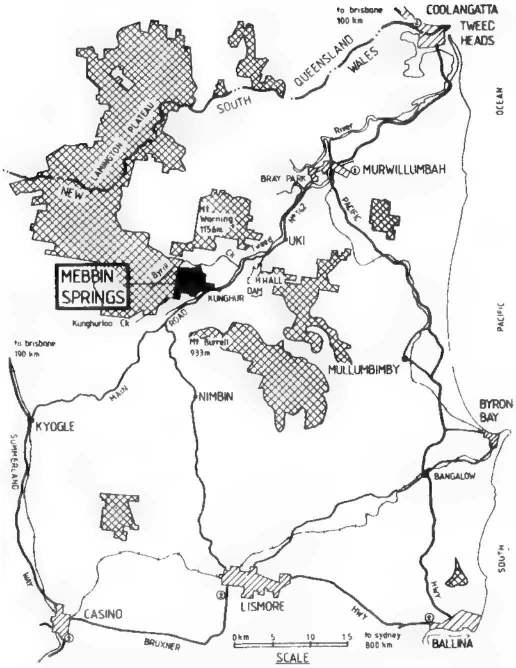
Moora Moora Festival

Moora Moora Co-operative Community, Mt Toolebewong, near Healesville, Victoria, Saturday, February 23, 1985.

"We're sick and tired of building mudbrick houses here at Moora Moora, so this year at our Festival we're going to dance our little socks off. There'll be music in the paddocks, music in the bushes, music in the treetops. If you are not too busy building your dream house, why not shake the mud off your feet and join us?"

There will be tours of Moora Moora, talks and displays on the environment, health, crafts and building techniques, wholesome food and drinks and lots of music, including the famous Bush Dance. Admission $16 per family, $8 per adult, $4 children and concessions and $5 for the dance only.

Moora Moora is about 16km from Healesville along the Don Road (towards Mt Donna Buang). Follow the signs, turning right into Nyora Road. If you would like to help prepare for the Festival, or if you have any enquiries, phone (059) 62 5975 or 62 4090.



The Permaculture Institute, based in Stanley, Tasmania, since its founding, now plans a move to Mebbin Springs in NSW within a year.

Permaculture is a design system which aims to produce an efficient, productive and ecologically sound integration of plants, animals, people and resources. Based upon energy-efficiency at all levels, it is governed by an ethical code of care of the earth, care of people, and sharing of resources.

By Bill Mollison

We heard about Mebbin Springs after we'd written the **Outlines for a Permaculture Village** earlier this year in which we proposed a village settlement based on Permaculture principles. We were interested to learn that plans for Mebbin Springs incorporated many of the design features of a Permaculture Village. After visiting the property and discussing the concept in detail with its founder John Burrell, we decided it was not only a suitable environment for the Permaculture Institute, but also that it is the most advanced concept of its kind in Australia, and in some respects, the world.

Mebbin Springs may be one of the very few settlements in the world to follow the example of Village Homes in Davis, California, in attempting sensible environmental planning for alternative rural occupation. Homesites have been carefully selected after an in-depth environmental study that allows for setting aside suitable areas for wildlife corridors, water catchment and storage, agriculture and so forth. A set of building guidelines has also been developed to encourage energy efficient housing.

The legal structure at Mebbin Springs is founded on a unique system of strata title for rural subdivision, which enables productive planning for the large area of community land that lies between residential titles, commercial titles and rainforest and wildlife reserves. People can enjoy the benefits of community open space and forest, while at the same time maintaining a high level of production on individually-owned and negotiable mini-farms with specialist products.

Plans are underway at Mebbin Springs to set up our own banking, marketing and educational systems, so that the community can control much of its own wealth and direct its resources into positive and productive areas. About 60% of the residents will be in service occupations, about 6% in primary production and the remainder in commerce and privately-owned business.

That a demand for such planned settlements is great has already been established by the amazingly fast selection of 150 of the available sites. Mebbin Springs has already attracted architects, teachers, market gardeners, carpenters, craftspeople, engineers, accountants, doctors and other professionals. Because of the range of highly diverse skills available, the enterprising spirit of individual lot-holders and the resources of 2400 acres of common lands, Mebbin Springs should be able to show that the sustainable occupation of rural areas can be achieved.

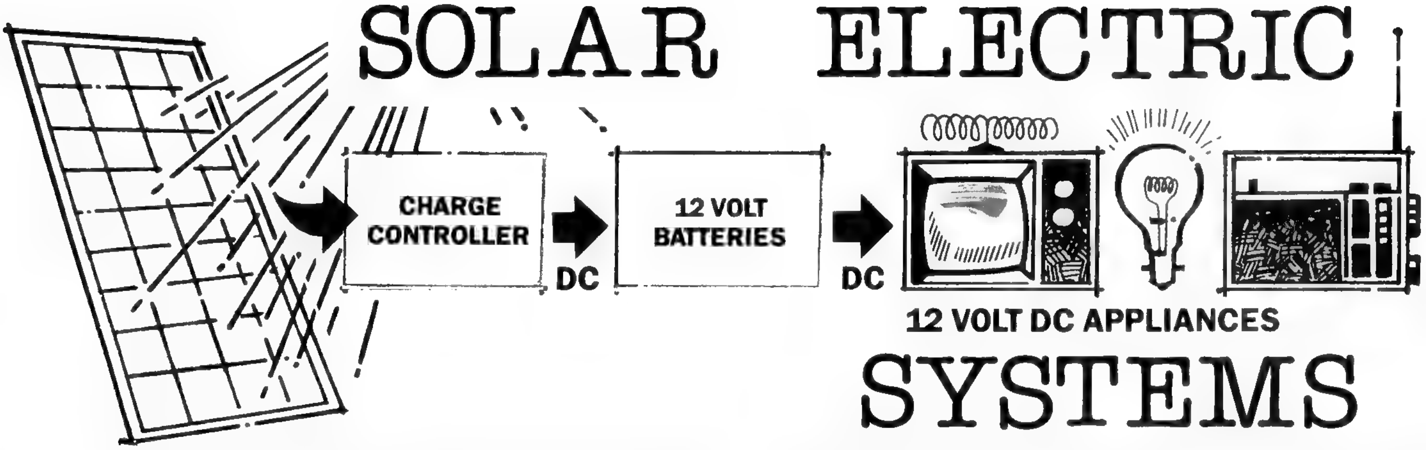
Mebbin Springs is attractive to people who want to leave the anonymous and increasingly untenable urban areas, but who do not wish to pioneer large, isolated areas of land, and who want a choice about the degree to which they co-operate with others.

The Permaculture Institute has been somewhat isolated and over-extended on land resources for a number of years. We are confident that with this move to a 5 acre site at Mebbin Springs, we will be able to demonstrate a good Permaculture use of land within five years. We plan unique energy systems and buildings suited to the sub-tropical climate. Dams and ponds will take up an acre or more and will be planted with a variety of useful water plants. Fruit and nut trees, fuel forests, and perennial and annual gardens will be placed appropriately. Permaculture design courses will be held on the site, drawing on the skills and experiences of many of the residents.

Mebbin Springs will provide a model for future community development; the planning group has already been approached to become involved in similar projects elsewhere. It may be several years before all of the systems proposed have proved themselves, and adjustments will perhaps have to be made, but the people attracted to Mebbin Springs are a determined and enthusiastic group, willing to pioneer such a concept.

- *Mebbin Springs proposes to settle 240 kilometres (possibly 1000 people), on 12sq km on undulating land near Uki, NSW. For further information, contact the Founding Committee, PO Box 231, Murwillumbah, NSW, 2484. Phone: (066) 72 4122.*

SOLAR ELECTRIC SYSTEMS



Only 30 years after they were first shown to be a practical method of producing electricity, photovoltaic or solar cells are bringing light, music, television and power for household appliances and tools to country areas around Australia, far from the conventional sources of supply.

In May 1954, three scientists working at Bell Telephone Laboratories in Murray Hill, New Jersey, USA, used experimental silicon solar cells to operate a small transistor radio. These men, Gordon Pearson, Darryl Chapin and Calvin Fuller, produced solar cells which were 6 per cent efficient in converting available sunlight into electricity.

After this breakthrough, Bell planned to use solar cells to power its telephone relay systems in rural areas of Georgia, but they proved to be very expensive. It was the space race between the Soviet Union and the United States during the 1950s which led to the improvements in efficiency and huge reductions in costs which make solar cells worthwhile now.

Energy was needed to power transmitters in space satellites and solar cells proved they had the right stuff. Vanguard 1, launched in March 1958, carried an experimental system of six small silicon solar cell arrays. It continued to transmit for years past its useful life, beeping away 24 hours a day until radiation caused its cells to deteriorate in May 1964. Satellites fitted only with batteries went silent within a few weeks.

Up there in space, solar cells operate satellite radio and telephone transmitters and 'eye in the sky' cameras, recharge batteries and beam television programmes around the globe. Down here on Planet Earth, the impetus to plug in the sun and use solar electric systems comes from the high cost of mains electric supply for country areas, where people are being quoted from $2000 to $35,000 for connection to the grid.

Advances in technology and mass production methods have led to single crystal silicon solar cells which are between 10-18 per cent efficient. In 1974 Tycho Laboratores (since taken over by Mobil Oil) first produced continuous ribbons of silicon which could be machine chopped into solar cells. Now 'second generation' polycrystalline cells, cheaper but slightly less efficient, are on the market in large, square solar cells.

The cost of generating electricity from solar cell panels or modules was around $1000 per peak watt in 1954, 200 ppw in the 1960s, $17 ppw in 1979 and in 1984 it is about $7.50-$10.00 per peak watt (not including batteries, inverters, etc). In the same period the cost of transistors for radios has dropped from $25 to 25c each. The United States Department of Energy (DOE) in conjunction with the United States Energy Research and Development Administration (ERDA) has established a target for the solar cell industry of 50c per peak watt by 1986 and 3c ppw by the year 2000 (in terms of the 1980 value of the $US).

The solar cells we use today are still not cheap and they are products of space age technology, far removed from the 'do-it-yourself' field. But in sunlight-rich Australia they offer a reliable energy substitute for our diminishing fossil fuels — one which does not endanger our lives or our environment as would nuclear power stations.

As usual there are choices to make and (as usual) they will be ruled by your outlook on life and how much money you can spare. You can use solar panels as building blocks in a low voltage, energy-frugal home generating system in which your roof becomes your power station. If you want more luxurious creature comforts, you can install a larger 240 volt system (using an inverter) or a hybrid system using solar cells combined with a diesel, wind or water powered generator and still be independent of the electricity authority.

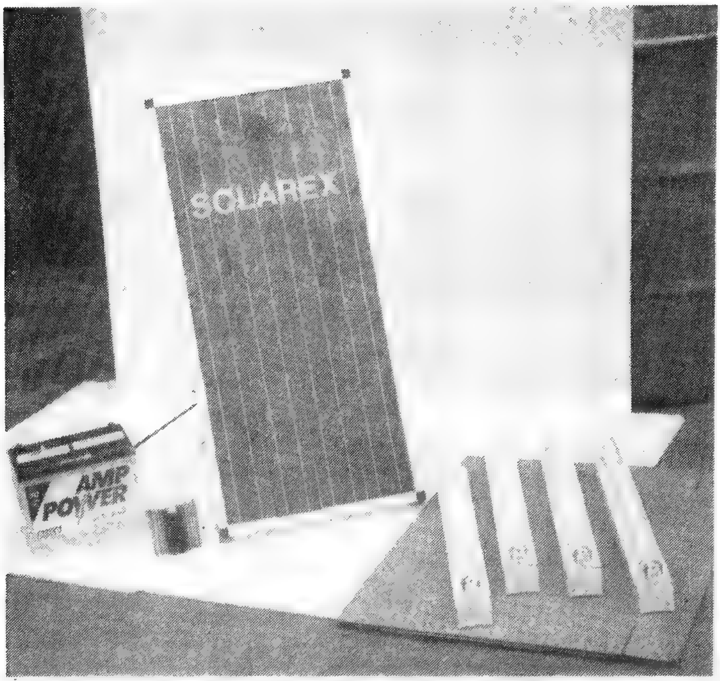
A lot of current has flowed through the wires since we first wrote about solar electric systems in Earth Garden 25 and in our self-sufficiency column in The National Times in 1978. Indeed most of the articles and books published on the new technology of solar cells at that time now seem very dated.

Until recently there has been little knowledge about how independent power systems work — and that has been provided by the suppliers and not the users. Now there are new settlers throughout Australia whose daily source of household power comes from the sun, people who have been running electric lights, radio and TV sets and basic comforts far from the grid supply for more than a couple of years, with no more quarterly electricity bills to pay!

The practical learning experiences of the Earth Garden readers on the following pages might turn out to be an eye-opener for you. Here at last are first hand accounts of living with solar electric systems which demonstrate how easily both small 12 volt DC and larger 240 volt AC solar electric systems can be 'made to measure' to suit each household's specific needs.

Don't let technical words, like watts, volts and amps, confuse you or deter you from plugging in the sun. Most of the jargon, definitions and electrical background you need to know before buying solar electric equipment is explained in the list of basic terms and concepts which follows.

Sources of suppliers of solar cell modules, batteries, inverters and low voltage appliances are given at the end of the section.



Solarex lighting kit, with solar panel, 4 fluorescent lights, 90 amp hour battery and regulator. Price around $760.

BASIC TERMS & CONCEPTS

AC (alternating current) — electric current which keeps reversing its direction, running alternatively forwards and backwards. The mains power-point electricity in Australian city homes is 240 volt AC, which reverses itself 50 times per second (50 Hertz).

Adapter — a device which changes DC to a lower DC voltage level, for car radios, etc.

Ampere (amp/A) — a unit which measures the rate of flow of an electric current.

Amp hours (Ah) — the quantity of electricity (charge) flowing in one hour. The capacity of storage batteries is usually rated by the total amp hours which can be withdrawn (from a fully charged battery) over 20 hours.

amps x hours = amp hours

Array — solar cell panels or modules wired together in a system and usually mounted on a frame of aluminium, timber or piping.

Charge — current applied to a battery to restore its available capacity, usually expressed in amps.

Converter — changes DC to a usually higher DC voltage level.

Current — the amount of electricity flowing in an electrical circuit measured in amps.

Deep cycle battery — batteries which may be discharged deeply hundreds of times (unlike car batteries).

Diode — a valve made up of two electrodes which allows current to flow only in one direction.

Discharge rate — electric current removed over a given time from a battery, expressed in amps, or per cent of battery capacity.

DC (direct current) — an electric current which always flows in one direction. Most storage or 'home lighting' batteries produce 6, 12 or 24 volt DC current.

Electrolyte — in a lead-acid battery, a solution of sulphuric acid which conducts electric current. Potassium hydroxide is used in nickel-cadmium batteries.

Energy — the product of **power x time,** measured in watt hours.

Fuse — wire which stops an excessive current in an electric circuit by melting.

Horsepower (hp) — an imperial system measure of the rate of doing work; the power needed to raise a weight of 33,000lbs 1 foot in 1 minute. One hp is equal to 745 watts.

Hydrometer — instrument to measure the amount of charge in a battery by reading specific gravity of electrolyte.

Inverter — an electronic circuit device which changes DC to AC. In a solar electric system an inverter is used to convert 24V or 12V DC to 240V AC.

Joule — the metric mechanical unit which is the effort needed to lift a 1kg object 1 metre off the earth.

Kilowatt (kW) — a unit of power equal to 1000 watts.

Kilowatt hour (kWh) — total energy of 1kW acting for 1 hour, equal to 1000 watt hours. This is the unit used to measure electricity consumption (take a look at your bill!).

Load — how much electricity you need to run any appliance, light or tool, or the total electricity required, expressed in watts hours.

Average daily load = total watts x time unit is turned on

Lumen — a measure of the amount of light produced by an electric light bulb. A 100 watt incandescent lamp produces about 2000 lumens of light.

Module — a number of solar cells (typically 36) joined together and sealed between shatter proof glass or transparent silicone plates.

Multimeter — device which measures voltage, current and resistance.

Panel — see module.

Peak watts — wattage delivered by a solar cell panel or array at noon on a clear day. Solar modules are usually rated in peak watts, typically 35, 37 or 42W.

Photovoltaic (or solar) cells — silicon semi-conductors, which convert sunlight directly into electricity.

Power — the product of **volts x amps,** measured in watts.

Regulator — see voltage regulator.

Rectifier — a device which changes AC to DC.

State of charge — available capacity in a battery, expressed as a percentage of rated capacity, measured by a hydrometer.

Transformer — instrument which changes AC to a higher or lower AC level (won't work with DC).

Voltage — a measure of the 'pressure' flowing through a wire in an electrical circuit, expressed in volts. Most car batteries are 12 volts DC.

Voltage drop — power that is 'lost' in the wires (especially in long runs of cable) from charger to load.

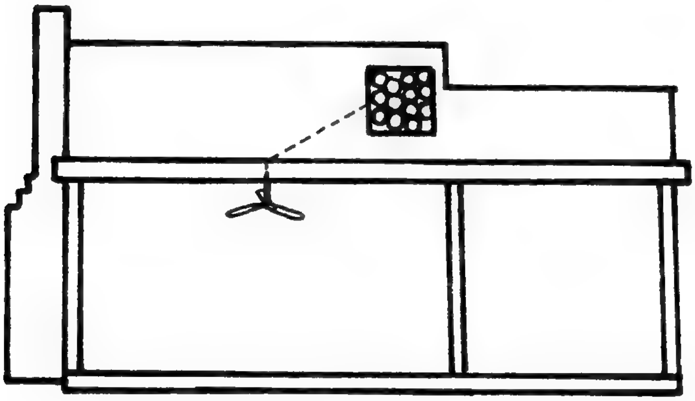
Voltage regulator — device between solar panels and batteries to avoid overcharging batteries.

Watt (W) — one Joule per second, a measure of the rate of flow (amps) multiplied by the voltage (volts) in an electrical circuit. A house light bulb operating on 240 volts AC typically requires 80 or 100 watts of power to light up a room. A watt is not a measure of the amount of light given off, which is expressed in lumens.

Amps x volts = watts (wattage of an appliance)

Watt hour(Wh) — a unit of energy measured as the product of power (ie, 1 watt) and time (1 hour). Used to calculate load to work out the size of solar cell panels and the number and size of batteries needed. A 60 watt light bulb switched on for 1 hour will use 60 watt hours of electricity.

STEP BY STEP

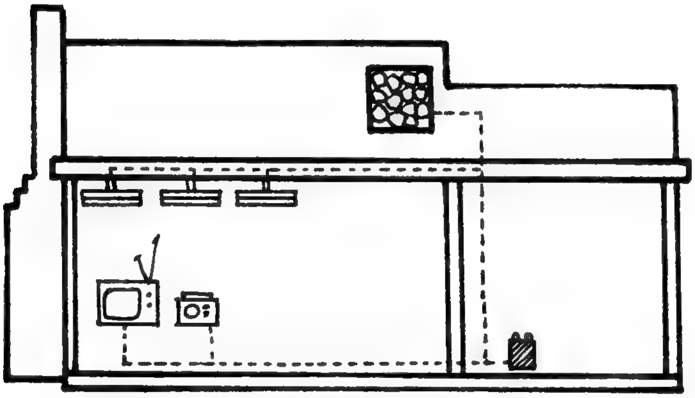


1. One solar cell module

1 solar module/no battery.

A single 12V DC solar module will directly power devices such as an electric ceiling fan, a small water pump or a transistor radio **only when the sun is shining.** You need a battery to store power to use these appliances at night or in cloudy weather. A solar panel may also be used to recharge a flat car, tractor or boat battery, or it may be hooked to a battery charger to recharge renewable 3, 6, or 9V DC nickel cadmium batteries to run radios, calculators, torches, electric clocks and so on. You can buy solar modules specifically made to charge batteries. **Price** around $400.

Other uses: Small pumps to run fountains, spray or trickle irrigation, solar water heater circulation or to fill agricultural and house water tanks. Use also for attic ventilating fan, small personal fan and most 12V DC appliances which will work in a car, boat or caravan.



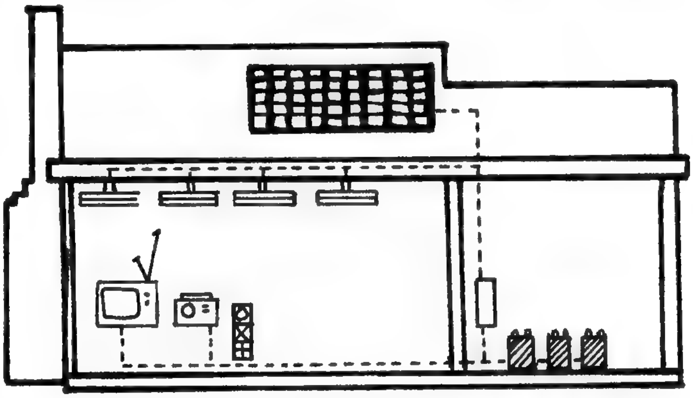
2. Starter kit/standby use

1-2 solar module(s)/storage battery.

The basic components included in home lighting or starter kits sold as a package by most solar cell manufacturers, distributors and agents make a good first step in building up a solar electric system. This may also be used as an emergency standby for power blackouts. Kits are usually made up of one solar module, mounting frame, 2-4 12V DC fluorescent lights and one 65 or 90 amp hour (Ah) deep cycle battery. The solar module may include a blocking diode, to prevent overnight discharge of the battery, or the kit may include a separate battery regulator. **Price** around $600.

This is a good setup to run lights, transistor radio, small black and white TV or cassette tape recorder for several hours a day (but not all at once) for a boat, caravan, weekender or remote location, or when building your home (lights, 12V DC drills etc). It will also run electric fences and security lights or turn on pumps (using a digital timer) while you are away. Store battery in a well-ventilated place, such as verandah or shed.

See: **No more candles,** by Ray & Lyn Boggon in **Earth Garden 36.**

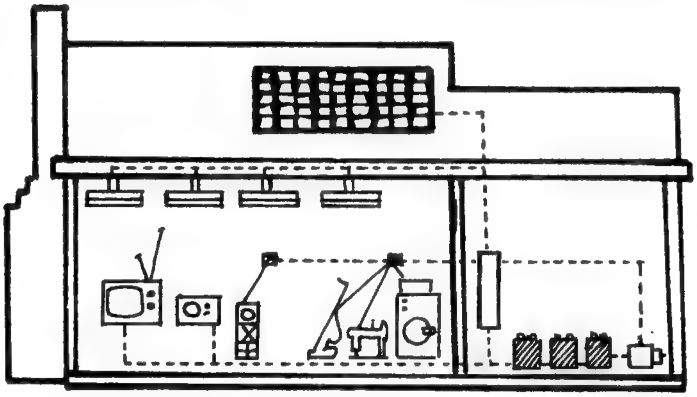


3. Basic 12V DC home power

3 solar modules/ 2-3 batteries.

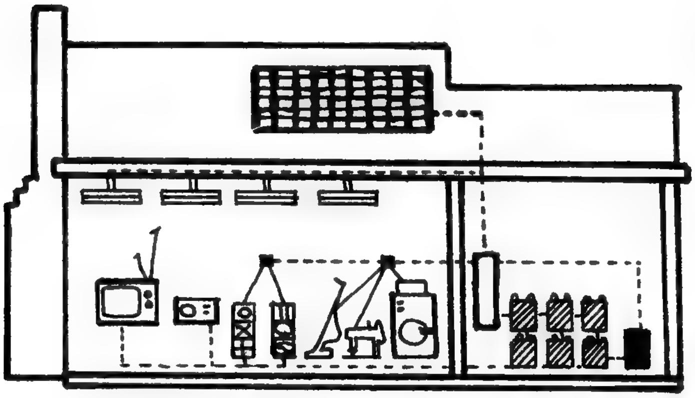
A move up to three solar cell modules, producing around 500 watt hours per day in sunny areas, will require the addition of a control box or battery regulator to prevent batteries being overcharged or discharged too much. This system, also available in kit form, will run all the previously mentioned 12V DC items, with more lights and more power to run 12V DC kitchen gadgets, drills, pumps or a small colour TV for longer periods daily. **Price** around $1500. Running a 12-24 volt 6 cu ft compressor-type portable refrigerator (which costs around $800) is possible from 2-3 solar modules.

See: **An electrifying tale,** by Greg Baker on page 21 and **Our 12 volt solar system,** by John Thiry in **Earth Garden 36.**



3A. Basic DC with backup generator

You can add a petrol or diesel generator to this basic DC solar electric system. Once or twice a week, when the generator is used to run a vacuum cleaner, sewing machine, drill or washing machine for an hour or so, the batteries are 'topped up' at the same time. **Price** of generators starts at around $500.



4. AC power system

6-8 solar modules /5-8 batteries/inverter.

This system yields about 1kW hour per day and will run all the 12V DC appliances mentioned before. The addition of an inverter allows 12V or 24V DC electricity to be converted to 240 volt AC power to run normal household appliances such as toaster, sewing machine, food mixer, blender, juicer, small colour TV, electric shaver, electric typewriter and even a washing machine for brief periods. Deep cycle batteries are best connected to make 24V for efficient use of the inverter. Eight solar cell modules connected in series will produce 24V DC. Be aware that different wiring systems should be used for low voltage (12 & 24V DC) and high voltage (240V AC) circuits. Inverters range in price from $60-$2500. **Kit price** around $7000.

See: **Six panels or $35,000,** by Harry Weller on page 24 and **Our solar-electric home,** by Michael Bos in **Earth Garden 26.**

5. Next step

According to your needs, your next step would be either to a **larger AC system** of 16 or more solar modules or to a **hybrid power system** made up of solar cells used in any combination with either a diesel or petrol generator, wind generator or small hydro electric power system. See: **Energy off the shelf,** by Chris Martin, on page 26.

CARRYING THE LOAD

Before you can make a decision about what size or type of solar electric system you should buy, you will first have to work out your intended power consumption. This is called the **load,** a term used to describe whatever you are running from your solar module or battery.

Presuming you need a basic system for your home, the load might consist of a light for each room, a radio, a small black and white television set and occasional use of 12V kitchen appliances and tools. You have to have an idea of how much electricity this requires before you can decide what kind of solar cell module, the correct cables and what capacity 12V battery you will need in your system.

There are three simple steps to determine the average daily load:

1. Select which lights and appliances will be used.
2. Find out how many watts each consumes — its **watt rating.**
3. Work out how many hours each day (on average) each appliance will be used.

The watt rating is often stamped or printed on a metal plate attached to transistor radios (typically 5-20 watts), fluorescent lights (5-40 watts) and black and white TV sets (20-40 watts). This example is given for a rather basic small 12V DC solar electric system:

Appliance	Watts (W)	Hours used	Watt hours (Wh)
1 x fluorescent light	15	5	75
1 x fluorescent light	13	3	39
radio	5	4	20
b&w TV	20	3	60
		Total load	194

The daily load for the four items used amounts to 194 watt hours. One solar module of 37 watts, given six hours of sunlight, would provide 222Wh per day — enough for this power use and allowing a little extra to cover losses in the system and cloudy days. Watt hours not used remain in the battery to be drawn on later. Most suppliers of solar modules will advise you on how to calculate the load you require and help you to match it to the best advantage with a solar module and battery.

CALCULATING WATTAGE

By Greg Baker

Some electrical appliances do not have a watt rating marked on them. One way to check on their power consumption is to connect them to the grid, perhaps in a friend's house. Let them run for a while with no other appliances connected. You can make certain of this by pulling out all fuses (or turning off all circuit breakers) except those for the power points.

Note how long the appliance is turned on and read the electricity meter before before and after the test. The meter reads in kilowatt hours (kWh). To obtain watt hours used, multiply this by 1000 nad divide by hours to get watts.

Thus if a refrigerator uses .5kW in 50 minutes of operation, it is rated at:

$$(.5 \times 1000)/(50/60) = 600 \text{ watts}$$

You can make the refrigerator run continuously by keeping the door open.

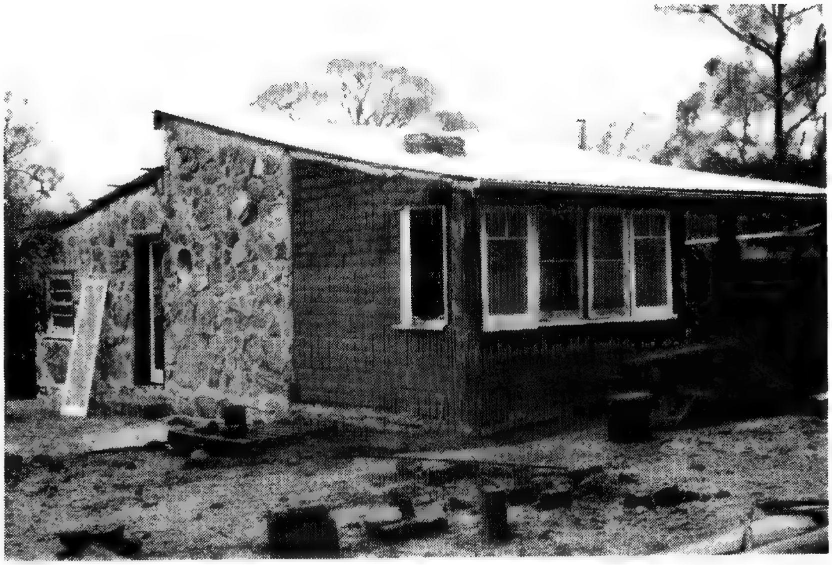
SAVING ENERGY

Major energy consumption is used by electrical appliances which produce heat or cold, such as a freezer, air conditioner, refrigerator, clothes dryer, toaster, electric stove or water heater.

Less power is used by appliances which drive motors of fans. Some things which you use only occasionally, such as washing machines and vacuum cleaners, will in practice fall into the middle rank of energy consumption.

Conserve energy by using, for example, solar water heater, gas cooker, LP gas or kerosene refrigerator, wood stove or wood heater fitted with a hot water jacket and by insulating your home and hot water storage tank.

Mudbrick, bush rock and solar



By Jym McPhee

Mudbricks, bush rock and solar panels are three of the main ingredients of our little 'hideaway in the hills' by the Goulburn River, 30 miles north of Mudgee, New South Wales.

Our house was built on concrete footings and floors with ironbark poles set 900mm into the foundations. A bush variation of Helen and Scott Nearing's stone slipform method *(Earth Garden 9)* was adapted for the main walls. We used 700mm width wooden formwork, securing two forms together by twitching tie-wire over removeable 250mm wide spacers.

Flat rocks from nearby paddocks were fitted best face out along the inside walls of the forms — rubble and cement being tamped into the centre space with steel reinforcing. About 24 hours after each run was laid the wires could be cut, the forms taken down and a new level set on top. Any excess concrete was scutch-chiselled off while the cement was still green.

For the roof native cypress logs were chain-sawn flat on the upside, tongue-and-groove cypress boards were fixed on the resulting flat surface, followed by double-sided *Sisalation* paper, hardwood batons and corrugated iron.

This makes up the main part of the house, being the kitchen and dining area at one end, with the lounge and its fireplace at the other end, stepping down to a bedroom and screened verandah. An adobe (mudbrick) extension followed, giving us a much-needed second bedroom and an indoor bathroom.

Due to the prohibitively high cost of having electricity connected (possibly as high as $30,000), some alternative was obviously needed, As refrigeration was taken care of by a *Sibre* gas fridge and hot water and cooking by the fuel stove, our electrical requirements were not excessive. A small 10 inch colour TV with video recorder and a stereo cassette player, plus an assortment of lights — fluoros (fluorescent lights) for efficient bright light when needed and incandescent globes when a warmer light was called for.

The solution, solar power. We started off with one M61 self-regulating solar panel and deep cycle battery from *Arco IPS*. It worked beautifully for about nine months before trouble struck. Exit one deep cycle battery valued at around $120. Problem, leaving battery in a low charge condition for too long. Solution, an extra panel and battery connected through an *Arco IPS BP12* battery protector. It stops the battery from overcharging and also reads the battery charge level every morning when the first rays of sunlight strike the solar panels.

If the battery, or batteries, are under 89% of full charge capacity, then it shuts off power to all non-essential loads. Later in the day (if there is sufficient charge input), the BP12 reconnects the power and everything returns to normal. The BP12 has the added advantage of security lighting during prolonged absences. Just leave a low wattage fluro (8-10 watts) switched on. It will turn on and off as the battery charge level fluctuates and it is comforting to know that when you return, you will have a minimum 80% of charge in your battery bank. The battery protector sells for around $65, which is good value when you consider that they may extend your battery life from around one year to five or more years.

We have been so impressed with our solar system that we decided to open a solar and alternative energy centre in a 110 year old shop in historic Gulgong (the town on the $10 note) and will be open for business in November. Anyone in the area who is thinking of using solar power, please drop in to see us at 91 Mayne Street, Gulgong, or ring us at home (063) 73 4740 and we would be happy to drop out and see you with suggestions to meet your solar requirements, whether it is for a simple 12 volt DC system like ours, or more complex 240 volts AC systems.

Keep your sunnysides up, Jym & Karen McPhee, 'Gleniston', Cassilis Road, via Mudgee, NSW, 2850.

An electrifying tale

By Greg Baker

The solar electric thing really started for us when the county council told us they wanted to knock down a 20 metre wide swath through our trees if they put the power on for us.

Valuing our trees and our privacy (who wants to live at the far end of a bowling alley?) we suggested an underground line. However, they really liked knocking down trees and refused. Apart from that they wanted an arm and a leg for the pleasure of doing it, they would own the equipment we'd paid for and send us huge bills four times a year.

We also discovered we could not legally wire our own house if it was connected to the grid and, let's face it, electricians don't exactly donate their time.

Now, even though we were only at our farm at weekends in those days, we like having a light at night. We still do, and we like a light that you don't get by burning fossil fuels, that doesn't need pumping up and one that can be turned on and off at will. I admit this is totally unreasonable of us, and we should go to bed at dusk or use a slush lamp with home-squeezed oil. But there it is.

We managed with hurricane, kerosene pressure and gas lights for a while until a friend drew our attention to a little wind generator which one of the established wind power companies was selling. It seemed that yacht owners use these to keep their batteries up to scratch while they're away earning the money to pay for the boat. So we got one and installed it about eight metres off the ground on the ridge of the shed.

A marvellous little machine it was, all plastic casing and blades, but it worked fine. We connected it to a couple of 25 watt incandescent lights in standard bayonet sockets. It was a bit dim, but it was convenient, and the little machine could keep us in power for two nights a week if we were careful and gave the battery a boost charge every so often.

It continued to work well until the storm that cleared a path through the bush near the house, snapping off grown trees about five metres from the ground. The shed took it alright for some reason, but the wind generator broke its clamping ring and scattered half its blades around the neighbourhood. We found all but one of them and, after a bit of reading, discovered governors. Needless to say, our little job didn't have one of those.

We tried to get another blade and the plastic clamping ring. The well-known supplier of windsets where we had bought it did not reply to our letter about the pieces, nor did the British manufacturer and the manufacturer's representative wanted $25 for the two pieces of plastic.

That was that. We returned to the kerosene drum and gas bottle and at least had the pleasure of a bit more peace and quiet during winds. Everytime the wind blew when we had the generator, we ran out to see why there were helicopters patrolling the area!

Several hundred litres of kerosene and the odd kilogram of gas later, when we had moved to the farm to live, we came across two magazine advertisements for solar panels, one from a manufacturer, Solarex and the other from a distributor. We wrote to them: the latter did not reply (perhaps the Redfern mail mangler fancies our mail) but the former sent us the essential details. As far as they saw it, anyway, but I'll come to that.

It seemed very simple. We told them we wanted 1120 watt hours per week and where we lived. They specified a system for us. To the 1120 watt hours per week, they added their estimated 20% battery charging losses, to get about 1340 watt hours per week needed from the panels. Peak output for the panel which was the cheapest per watt (X100G) was 37 watts. This gave for the average five hours of sun per day in our area — 37 watts x 5 hours x 7 days = 1295 watt hours per week. Easy, eh? And the perfect panel for the job. And if we wanted a week's storage, that was 1120/12 = 93 amp hours. That meant the 90 amp hour 12 volt deep cycle battery from Besco.

The sums seemed alright, so we sent off our money for a panel, a regulator, a battery and one fluorescent fitting and tube to kick it off. We thought the fluorescent light a good idea because of its superior light output per watt of power input.

When the gear arrived we took it gingerly out of the boxes then stood around, hands in pockets, mouths open, looking at it. Very nice it was, all shiny and high-tech looking. The 21st century had arrived! Eventually we decided it was safe to play with and being part of the written culture, looked around for instructions. There weren't any of course, so we resorted to the telephone to get information.

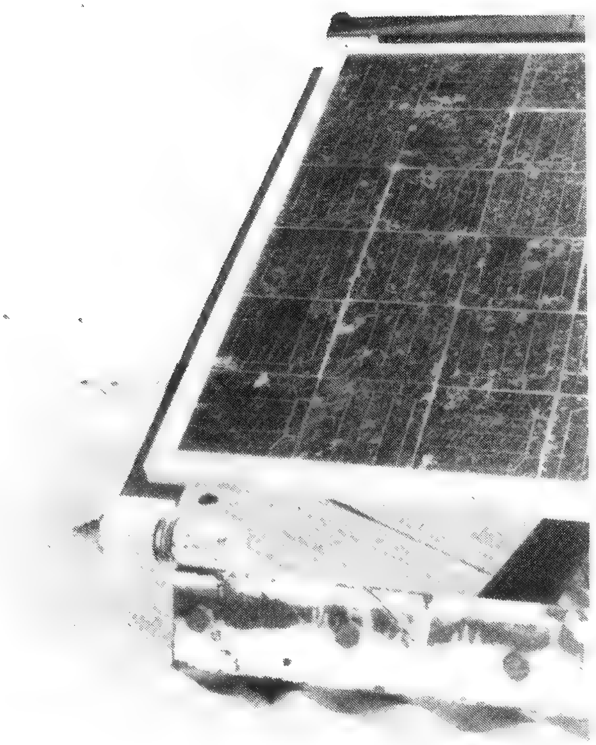
They told me which terminals to wire to which and where to point the panel. It had to be raised from the horizontal by an angle equal to the latitude and to face north. My friend asked which north was required. Which north? What sort of a question was that? I discovered there were several and what was recommended was true north. It turned out that the shed roof was at the angle of the latitude above the horizontal and faced magnetic north. She'll be right, I said, we'll whack it up there. There's only 12 degrees difference between magnetic and true north.

My friend looked dubious and asked what I was going to do about the big tree to the east of the shed. I don't know if you've ever had to live with that sort of thing; if you haven't, it's very tiring. It seemed that the most sensible thing to do would be to point the panel not at a true north (which would be fine on a flat and treeless plain), but halfway between sunrise and sunset at the panel, that is, make allowances, if it is shaded in the morning or evening by trees or mountains.

It was still to be mounted on the shed roof, but with a more complex frame to get it angled correctly. I spent half a day slithering around on the corrugated iron putting it on, pockets bulging with tools, bolts, washers and any other bits and pieces out of the shed that I thought might be useful. Oh, and adhesive dressings and ointment. I always seem to smash up my left thumb when working on iron roofs.

Finally it was wired up and we anxiously waited until dark to try it out. A few neighbous came round for the great unveiling. At last the time came. After the speeches I threw the switch. Nothing. Absolutely nothing happened. Just that little click and continuing darkness.

Everyone was very nice about it. They returned to their grid-connected houses, leaving me with the torch in my teeth on the roof examining the wiring. I don't know what



The panels are mounted on a steel frame which is hinged to allow the angle to be altered each season to maximise output. Hinges are heavy-duty factory door hinges and have inbuilt grease nipples for regular greasing.

frightened me more, falling off or swallowing the torch. I had visions of a final plummet to the ground with my navel glowing all the way down.

I finally traced it to a loose connection. Perhaps there was a better way than twisting the ends together and swaddling them in insulating tape? There was of course. We discovered the terminal block which gives a neat and secure mechanical joint.

The system worked all right then, all through summer and autumn and we started to run a few things on it. Like the radio. It seemed silly to buy 9 volt batteries and throw them away when exhausted. Why not put it on the 12 volts? It was only 3 more volts after all. It ran really well too, a bit louder and clearer than it ever ran on 9 volts. I didn't really mind the faint smell of burning insulation, but my friend found it objectionable and unnecessary.

Anything for a quiet life. I did some reading and realised that I could wire a resistor in series, knock the voltage across the radio back to 9 volts and remove the smell. It needed a few measurements to work out the value of the resistor. Measurements meant getting a multimeter. I'd always wanted one but had been hard pressed to justify it on our budget. Next time in the big smoke saw me tripping around the electronic stores. I tracked one down for under $10 which seemed to do all we would need for a few years anyway.

I won't bore you with the details of the measurements, but the multimeter was essential, as were a few electrical formulae usually found in the introductory chapter to books about electricity. I broke the radio's case getting in at it, and by the time I'd finished I was tempted to display it at the next local art and craft exhibition.

The multimeter was a little beauty. I could measure voltages, currents and resistances all round the system. Not only that, it looked as though I knew what I was doing and gave me all sorts of excuses in times of crisis. For example, voltages just have to be measured after meals, well round about washing-up time. And at other times, such as when the grease trap clogs up and has to be cleaned out.

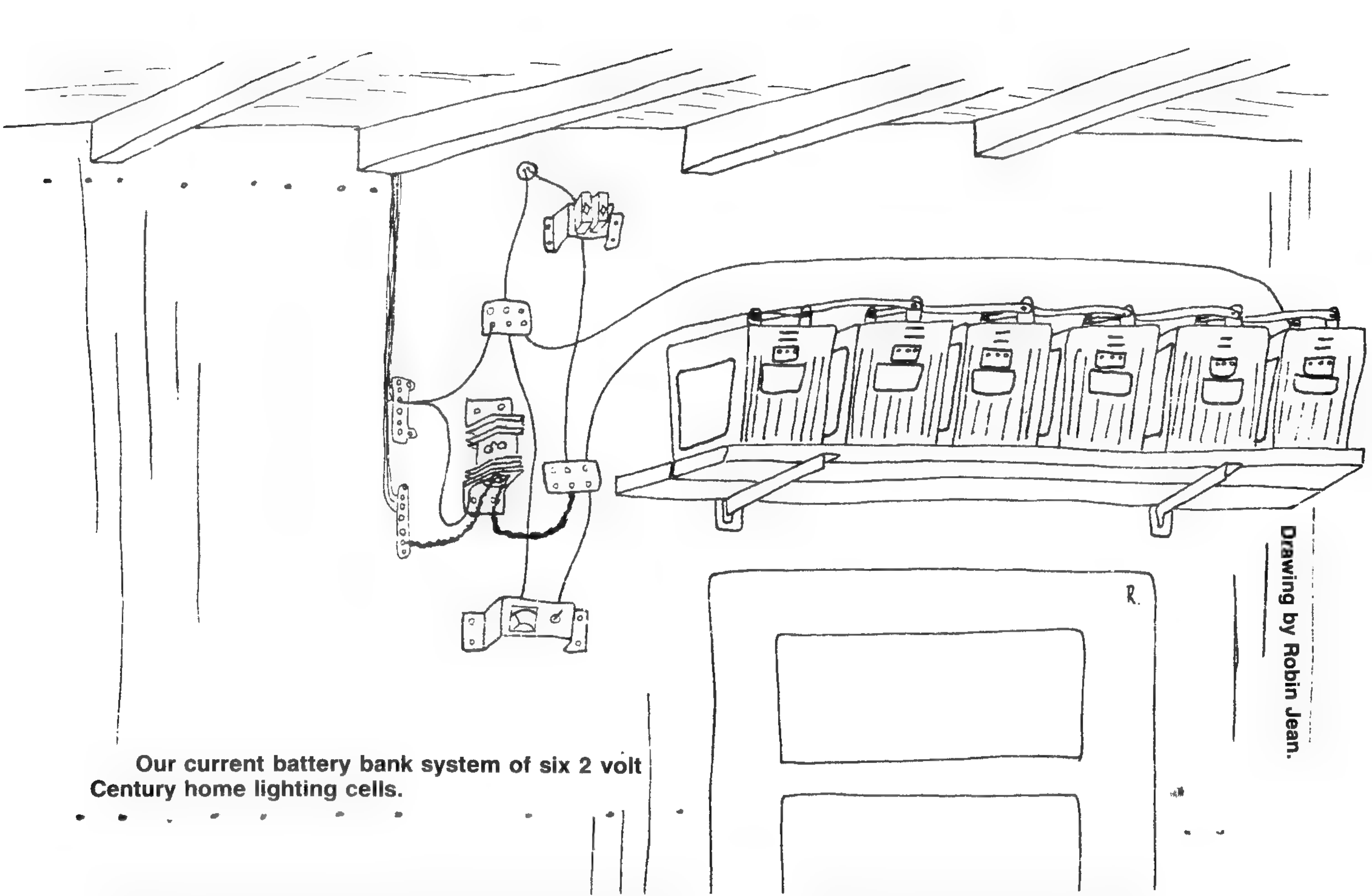
The meter itself was simple. All I had to do was to plug the test leads in different sockets in the case to measure different things. All went well until the day I found out about overload protection, or lack of it. It was the day the floor needed scrubbing that I found I just had, for the continuing successful operation of the system, to measure resistances for two or three hours. In the urgency of this job I plugged the leads into the wrong sockets. There was a red glow I'd never seen before. Odd, I thought, as a cloud of smoke emerged from the case. That sort of took the fun out of it and the multimeter didn't look as impressive with the case all melted into the shape of my hand.

Anyway, all went well with the system until winter came. The sun didn't come out as often and we wanted the light earlier. After a few weeks the lights went out. I explained to my friend that on average the lights were really on. My friend was sceptical, so I explained that in summer, when there was more sun, we could put more lights on for longer as compensation. Some people just will not listen to sound, well-reasoned scientific argument. I checked the battery; the hydrometer said it was flat. We decided then that we should have found out what the sun produces in July, not the annual average. The solar people are our friends, I said. They wouldn't mislead us. They're part of the new culture too. When my friend recovered from a spasm of laughter, I got an earful about them being just like washing machine or car salesmen, except they sold solar gear.

We really had to cut back after that. There just wasn't enough sun in July and August to give anywhere near 1295 watt hours per week annual average. Coming into spring the sun was out a bit more often, we had light and radio every night, but the hydrometer still showed a flat battery. I couldn't figure it out. Solarex suggested giving the battery a good shake to thoroughly stir the electrolyte. Great idea, I thought, disconnecting the battery. It had white plastic handles ready for the job. All I had to do was pick it up, just pick it up, just . . .

After having the hernia strapped up and my hands bandaged because of cuts from the razor-sharp plastic handles, I tried again with the hydrometer. It was up a whole 0.25 and still dead flat. Staggering, I wasn't keen in trying to shake it again, so we took it for a long drive in the back of the utility just to shake it up a bit. On the way back we even connected it to the car generator, but all we got was a slight increase.

The only thing that made sense was that the electrolyte had settled out, so that it was more dense at the bottom than the top of the cells. We had discovered electrolyte stratification. Unless a battery is regularly charged beyond what is called the gassing voltage (the voltage of a battery increases as it is charged from flat to about 14 volts at gassing), the electrolyte will settle out, reducing capacity and battery life. The lesson is to have sufficient panels to make the electrolyte gas, particularly in July-August. If the battery is not fully charged and you continue to take out as



Our current battery bank system of six 2 volt Century home lighting cells.

Drawing by Robin Jean.

much as is being put in, the system will work, but gassing voltage will not be reached and electrolyte will stratify.

Because we didn't understand any of this at the time, I wrote to the battery manufacturer. No reply. I wrote again. They thought I wanted to sell the batteries. Why else would I want technical information? They sent me a semi-technical publicity booklet and a price list with some amazingly low prices. (Shop around for batteries — solar retailers charge too much.) I wrote again, twice. Still they ignored me. I finally managed to get a response by writing to the parent company. The technical manager rang and we had a useful yarn, but the damage was done. They hadn't helped over such a long period (during which the battery became incapable of holding anywhere near 90 amp hours), so we decided that the replacement storage system would have to come from another manufacturer.

We also discovered that the more you take out of a battery on each discharge, the shorter will be the life of the battery. Hence it is really necessary not only to have sufficient panels to ensure gassing at the end of each charging cycle, it is also necessary to have plenty of battery capacity to ensure that the batteries are not often discharged below about 50% capacity. The original system specifications did not allow for either of these things.

We were due to expand the system by this time anyway so we got two more panels and six 2 volt Century home lighting cells. These are the sort with the little coloured balls to tell you the state of charge at a glance and with transparent casing so you can easily see the electrolyte level and whether or not the cells are gassing. We found that the 2 volt cells brought us great versatility. We can run things on three cells and get 6 volts, four cells and get about 9 volts, or all six cells to get 12 volts. Now we can run the cassette tape player on 6 volts and the radio and, dare I say it, home computer on 9 volts.

We also got a great swag of fluorescent light fittings. Again, these were far cheaper to buy direct from the manufacturer (in our case Minitronics) than from the solar retailer.

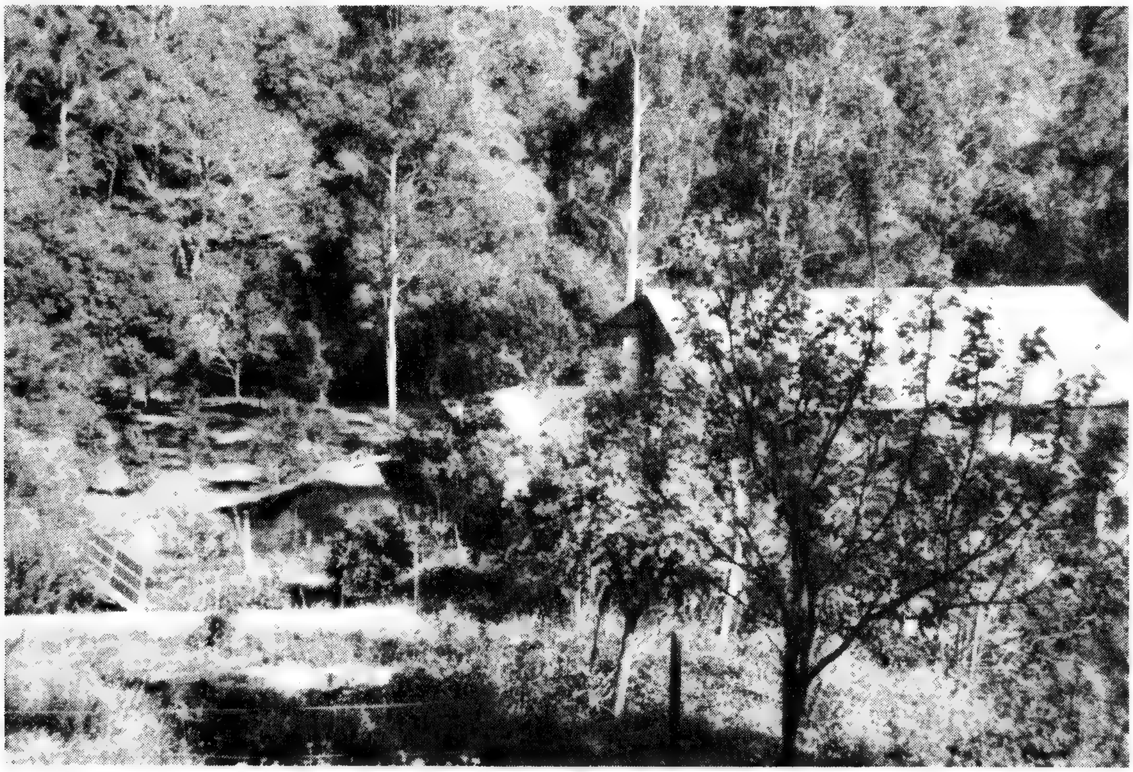
We went fancy when mounting the solar panels this time. We built the frame ourselves and based it on two huge hinges so we could tilt it up and down as the sun moved in the sky from season to season. While the rule of thumb says to mount panels at the angle of the latitude it is really better to tilt them higher if they are fixed to maximise July-August output when the sun is lower in the sky.

The lessons? The big one must be to be as wary of people selling solar equipment as people selling anything else. Their reasons for specifying and selling particular equipment and combinations of equipment may not lead to the best equipment for your applications, or to the cheapest price.

Similarly, rules of thumb should always be treated as just that. Try to see what lies behind them and modify them or make them more precise as you require. For example, to specify wires to be as thick as possible and as short as possible is not really a whole lot of use when you're the person choosing and paying for the wire. Wire it yourself, then you're in a better position to fix it if needed. Remember it will usually break down on a Friday after 5 pm.

Calculate panel and battery requirements for the month when you have least sun (July in most parts of Australia). And get a multimeter . . . less than $20 from a big electronics retailer.

We still have a lot to learn, but we don't regret that or getting our solar electric system one little bit. After all, that's what it's all about!



Six panels or $35,000?

By Harry Weller

Two years ago we were quoted $35,000, plus $1000 per year minimum electricity charge for 15 years by the Queensland Electricity Board to connect us to the grid, a distance of 3 kilometres. Needless to say, we rejected that outright!

We planned to build our house in a valley, running north-south, on the 60 acre property because of cool prevailing summer breezes, shelter from winter westerlies and southerlies and the permanent unpolluted creek nearby.

The topography rules out wind generation, so we opted for solar electricity, which appears to be cheaper and more trouble free. We knew the winter months would be a problem because even the best site for the panels only provides 4½ hours of peak sunlight from May to August. We could get several more hours if we were prepared to cut down a row of gums along the creek bank.

The house is not small and has three bedrooms, a lounge, dining room, kitchen, two bathrooms and a spare family room, which are all spacious. Outside, in a separate building next to the house, is the laundry, pantry and workshop. The house is heated by a combination of passive solar (in a small way), which is a story of its own and a large **Franklin**-type fireplace. Cooking is done on a **Stanley** slow combustion stove which also provides hot water, and an LP gas cooktop.

Lights. Our prime concern was for adequate lighting. We have installed 33 x 12 volt fluorescent lights made locally here in Brisbane. They use a standard 20 watt 240 volt tube and only draw 1 amp. While we don't attempt to slavishly economise with the lights, we certainly don't have the house ablaze with light all night. The lighting is wired on five different circuits and 10mm^2 single core cable was used throughout, except in the short branch runs where we used a smaller size cable. No matter how many lights are on there is no dimming of any light.

Power. 12 volt direct current (DC) power comes to the house via a fuse/switchboard from a bank of five 105 amp hour deep cycle **Besco** batteries. The source of supply which charges these is an array of six X100G **Solarex** panels.

Our 240 volt alternating current (AC) power for television, small appliances and tools is provided by an inverter (500 watt maximum). We use the **inverter** a lot for charging recyclable batteries which we use in radios, drill, shaver and garden sprayer. More and more appliances are coming out with rechargeable batteries and, while they have their little quirks at present, I think there is a future for them.

Generators. A 5 KVA generator with an electric start (so that even my young daughters can start it) is used to produce 240 volt AC power for laundry, vacuum cleaner, larger appliances and larger power tools. This costs about $1.50 an hour to run. We wouldn't use this large generator more than two hours per week, unless we have some big building project in hand.

We also have a small **Yamaha** 500 watt generator (very quiet) which costs about 20 cents an hour to run. We use it for video recorder, juicer and even the TV if we want to conserve battery storage in a long spell of dull weather (very rare here). We try to use a number of appliances at once with the larger generator to reduce fuel costs, for example, when Lyn is doing the washing, I'll use the vacuum cleaner and we frequently have the wheat grinder going and batteries charging at the same time.

This all sounds like a lot of gear, costing a lot of chaff, but it beats $35,000 by a long way. I guess I could have a much cheaper setup, but I like convenience and am not one to scrimp or 'make do' with trendy improvisations.

Our neighbours have a much cheaper and simpler installation than ours and it is quite sufficient for their needs. They use two solar panels and two batteries to supply 12 volt DC power for 10 lights and TV and a 5 KVA generator for washing, power tools etc, with gas for cooking and refrigeration. Their site gets several more hours of sun than ours does in winter, so they only need two panels. They do not have a voltage regulator, but switch off the panels when the batteries are over-charged.

Our installation costs:

Generator 5 KVA	$900
Generator 500 W	500
Solar panels	2600
Batteries	450
Voltage regulator	200
Inverter	500
	$5,150

All these items were purchased new.

The wiring and lights would have to be installed anyway. The lights cost $38 each and I guess you could get away with cheaper lights in the city or if you were on 240V AC mains power, but they are good quality and throw a good soft light.

The wood-fuelled cooking and heating stoves are an extra cost, of course, but the wood is free, off the property. At my age, 59, it would be easier to switch on a three bar electric radiator or turn on an electric range rather than to chop the wood, but I am still fit and able to do it. It is good exercise and I keep thinking of the extra $250 per quarter that the QEB wanted to slug me for power, plus the interest on my $35,000! Gas costs us about $2.50 per week, which is for the fridge and a little cooking, mainly in the summer.

On the whole, I really don't consider the cost of our power system to be exorbitant and I think that it will have paid for itself within 10 years compared with electricity charges.

There are a few points to watch:

Refrigeration is the most difficult facility to provide in an alternative power situation. There are 12 volt refrigerators available, but if you can justify $700-$800 for a 6 cubic ft fridge, plus at least two extra solar panels and a couple of extra batteries (a total of $2000) you have more money than I have. It is not feasible to run a fridge from a generator except in some very isolated private or commercial instances.

A fridge should run for about 16 hours in 24 hours during summer. The only satisfactory solution is LPG. Our fridge is 6 cu ft, cost $900, is very efficient and costs us about $2.50 a week to run, which is a lot less than our electric 12 cu ft unit used to cost us in the city. **But** we can't store surplus vegetables or sides of meat, or kid's iceblocks or even ice cream, because we just don't have the space. However, we have adapted to this problem as well as all the others. It is a matter of being **compelled** to adapt.

Our pantry is large and cool (but not cold), being built into a hill using blocks and concrete, and it helps with general storage of fruit and veg in all except extreme summer heat. A cool house, with extra wide eaves (up to 1.5m) is a help too.

Inverters are handy little gadgets, but some dealers are misrepresenting the capacity of this equipment. An inverter will **not** run any appliance with wattage input greater than the inverter's rated output. My experience is that they are not suitable for video recorders or stereo players.

An inverter will produce about 80 per cent of the energy that goes into it, which will give your batteries a fright if it is used excessively. Only the smallest inverters can be used from 12 volts. The bigger types need 24 or 32 volt supply.

Batteries. Secondhand batteries or cheap car batteries are **not** designed for this type of work. Ask any reputable supplier of home lighting batteries to explain why and also to suggest the best batteries to use. This is a lengthy subject in itself and the best is certainly more costly, but you get what you pay for.

Deep cycle batteries can be discharged completely (deeply) hundreds of times. Car batteries cannot. It is possible to keep the cells fully charged all the time, even with the use of supplementary generation and a battery charger, then do so. Ours have never been below 12V. It is a good insurance to check them regularly with digital volt meter and a hydrometer.

Wiring. Cable size with low voltage systems is critical and a light cable will cause voltage drop. This can be substantial with a cable run of 10 or 20 metres, say from solar panels to batteries and from batteries to lights or appliances. Get **reliable** advice if you can find it and carefully calculate the maximum size cable needed, then use the next size up. Don't let the electrician tell you that you can use standard 240 volt cable, except in those rare cases when distances are short.

Switches for low voltage electricity are obtainable. Again, you need reliable advice which should be obtained from the manufacturer, not the electrician.

Voltage regulator between panels and batteries is advisable to avoid overcharging batteries and your battery supplier is the best person to describe the results of this. **Solarex** are reliable suppliers.

Solar panels must face north and be set at the correct angle as recommended by your supplier. Tracking devices are a good idea in some situations too.

The site for the panels is important, naturally. We are in a valley with heaps of gum trees 60-90ft high and in all the wrong places as far as solar panels are concerned. So we have six panels, where we could have used three or four. That was our choice, so we foot the bill. You have a choice too. I should point out that the eucalypts are well away from the house, but you have to see this site in all its grandeur and beauty to appreciate it. We did not put the panels on the house roof, as it is very high and steep and difficult to get to.

All these comments tell you a bit about solar electricity, except for the fine print and the details. These have filled a number of books and a lot of magazine articles. That is where I got my information, sifting the grain from the chaff, and believe me there is a lot of chaff about, not the least being the guff from those allegedly learned souls who oppose solar power for whatever reason grabs them, particularly cost, which is not excessive compared with some electricity authorites connection costs.

My family likes it and has no choice anyway. We are practical enough to adapt to it and, above all, we miss the Electricity Board's quarterly bills, strikes and blackouts like a boil on the neck! I know solar electrics has a great future, but not enough people use it, and even less use it properly. This way we can all learn in the field from practical applications rather than from textbooks which need to take a necessarily less broad overview.

Energy off the shelf

By Chris Martin

Like many **Earth Garden** readers we were faced with an impossible power connection fee which increased faster than we could save the money to pay for it. We also preferred the independence of 'pay-as-you-go' and of not being subject to strikes and blackouts.

We were quoted roughly $9500 to run the powerlines 200 metres, including a transformer and two poles, but we were told that if we wanted a firm quote we would have to pay a $300 investigation fee and that the lines and transformers would not be our property.

Discussing our power needs we found that small self-reliant power systems could not really cope with high power uses such as ironing clothes or heavy power tools, so our system would have to include a 240 volt generator. The big advantage of a multi-component or hybrid energy system is that you can add on as finances permit. At the same time you might find that you adapt to using less power.

Where to start

Unless independent power systems are well developed in your area, your first purchase should probably be a 240V petrol generator. A diesel motor generator is quieter and more efficient on fuel and will last a lot longer, but it costs at least twice the price of a petrol model and is not as easy to service.

A 3-5 KVA model with a 7-10 horsepower (HP) motor will last a lot longer due to less strain than a 2 KVA model with a 5 HP motor. In most instances there is no need for a remote or electric start model, but an alternator with a good engine, for example a **Honda,** or a **Briggs & Stratton** with a cast-iron sleeve, is good value. A recoil start and a battery-charging capability is also worthwhile. A generator (or inverter) rated at 2KVA will deliver 2KW (VA = volts x amps).

Remember that a petrol generator, to prevent the engine from coking up, must be run at least at one-third demand. We cannot over-emphasise the fact that an undersized generator is poor value. We have had our Honda with a **Powerlite** generator for five years and, apart from sticking valves, it has built our home and provided power for many other purposes. The only snag comes if you want to use equipment with a heavy power demand, such as an electric welder. If you are contemplating this kind of work there are units on the market which will weld and also provide power. However, they are not very portable and cost from $1750.

Natural energy sources

Before deciding whether to use solar or wind power you need to have a close look at the amount of power these sources will provide.

There is a basic chart which shows that much of New South Wales has an average of 5.5 hours of sunlight per day, but if you live, as we do, near mountains (the Warrumbungles), it would be best to underestimate and use the 3.5 hours per day quoted for southern areas. The Bureau of Meterology in each State will provide a wind chart for most areas compiled over the past 25 years and free of charge. Most of these readings are taken at a local Post Office or airport, so you will again have to make some allowances for your location.

We had hoped to use a wind generator to supplement our solar system in winter but we found there was more wind above 16 kilometres per hour in summer than in winter, when we really needed it.

Solar electrics

Initially we started dealing with a national solar panel manufacturer. They were helpful but, we found limited in their versatility. We have four **Solarex** X100GT panels wired in series to produce 24V and about 4-6 amps, depending on the available sunlight. These are mounted on a wooden frame which can be raised and lowered to give the best angle to the sun, depending on the season. We believe there is probably a good market for a mass-produced system, which will track the sun and increase the output of solar panels.

It is interesting to note that we get an extra 1 amp out of our panels due to the higher reflection property of the new galvanised iron roof on which they are mounted.

We were advised against getting the self-regulating type of solar panels as they cannot be over-ridden. It is necessary to be able to over-ride the regulator at times because the batteries need an occasional 'boil-up' to keep them in peak condition.

Wind power

It is a bit hard to judge whether or not there is enough wind in our area for wind power. We worked on the basis that if there was enough wind to pump water, then there would be enough to run a wind generator. As we found out, to our disappointment, it takes at least twice as much wind to produce power as it does to shift water. For example, most windpumps will start to pump water in a breeze of 8 km/h and will continue to work at 4 km/h. On the other hand most wind generators will not begin producing power until there is a 16 km/h wind and require about 40 km/h for maximum power output.

With a windpump, site location is important. With a wind generator location is **critical.** For effective performance a minimum tower height of 10m is required and the unit must be located at least4.55m above any obstruction within 120m. As wind generators have only two or three blades they are much more susceptible to wind turbulence than fan bladed windpumps.

The distance between the wind generator and the battery is also important. Distances up to 60m are practicable. Above this distance cable costs can be prohibitively high as larger size cables are required to stop power losses.

We have 240 volt 400 watt Winco **Wincharger** and have experienced some teething problems with it. All this has now been sorted out, either with the importers, or direct with the factory. The unit is currently imported from the United States and is supplied with a 3m tower which is useless for many locations. One outlet we spoke to said that they had at least 10 towers sitting out the back. Winco has advised that from the end of this year they will be selling the generator without a tower which will make it more cost competitive with solar power. They will have available a tower which may be purchased in 3m sections up to 24m. However commercially available towers are expensive and we were quoted $1200 for a 15m tower, plus installation.

We are currently having plans drawn up by an engineer, Bob Francis of **Powerstore,** for a 15m tower to cost less than one-third the price of a conventional tower. The

wind generator will also be able to be winched up and down for easy servicing.

Power regulation

With a medium-sized unit such as ours an effective control, monitoring and regulating system is required. Charging rates and the state of the batteries may be checked at a glance. Our **Powerstore** board, while not cheap at $590, includes a regulator and four circuit breakers and deals effectively with 12 batteries and a three-way system. The regulator is required to stop batteries overcharging, but also includes a bypass switch to allow the occasional 'boil-up' to prevent sulphation.

Inverter

We also have a 2 KVA **Powerstore** inverter, which we feel is the best value on the market as it has a transient rating of 4 KVA which allows the extra starting of electric motors. It also features a built-in high amp reverse cycle battery charger. We have experienced some problems with the unit, mainly due to faulty electrical components, but have received excellent service from Bob Francis (**Powerstore's** address is PO Box 60, West Wallsend, NSW, 2286). The unit also has a switching system that automatically changes from invert to charge when the generator is in operation.

Batteries

There are 8 **Besco** 850 90 amp hour batteries in our system and we have recently purchased 4x6V PG613 **Century** batteries.

The Besco batteries were originally quoted as having a 10 year life span and a one year guarantee. Recent information suggests up to five years of life is more realistic and they have reduced their guarantee period to six months. They appear to be fairly temperamental, sensitive to sulphation and really require a recharge rate similar to the rate at which they are discharged. With a relatively large battery bank such as ours it is a bit of a nuisance having to regularly use the hydrometer to check individual cells and to have to remove batteries from the racks to check electrolyte levels.

The only way to rid batteries of sulphation is by 'rocking' them, like rocking a car out of a bog. The battery needs to be discharged and then recharged to a slightly higher level than it was originally. Then discharge again by, say 150W, over one hour, then recharge again. This performance needs to be repeated until the battery is fully charged. The only way to do this satisfactorily is to use a battery charger and generator. As this may involve a fair amount of fuel, the moral of the story is don't let it happen in the first place!

After experiencing this problem ourselves we feel that the Century batteries are a better long-term investment. They are easier to monitor with their clear battery cases and state-of-the-art float balls.

PS: After adding the Century batteries we found them to be incompatible with the Besco batteries. This is due to the higher amp hour storage capacity of the Century units — 162 AH against 90 AH. We had hoped we would be able to use the Century batteries to monitor the Besco's, but it won't work. Therefore, we would like to change over to Century batteries entirely. If anyone is interested, we are offering our 10 month old Besco Amp Power batteries at $65 each. They are not suitable for big systems, but would be okay for smaller ones.

Wiring

Our control system allows for three separate wiring circuits to be run. They are 12V DC, 24V DC and 24V DC-240V AC through the inverter. While heavier wiring is required for 12V we still prefer to use this for lighting and small appliances rather than running 24V as well for the lights. The main disadvantage of this system is that power use drains the battery bank unevenly and only every second day is there the opportunity to fully charge the batteries. This problem is due to the regulator reading the first cell to reach maximum charge and cutting in at this point.

We recommend multi-strand cable rather than single strand for both low voltage and 240V wiring. It is more costly, but if you happen to break one wire of the seven in 6mm cable, it does not matter so much. If you break the single wire cable you either have to find the break or replace the lot. Single cable wire also is not as pliable.

Use proper low voltage switches and power points if possible and also use the two-pin T plugs and sockets for low voltage appliances as this eliminates any possibility of plugging 12V into 240V by mistake. We also use the old-fashioned cord pull switches for lighting. The are fun to find in the dark, but save a lot of wiring.

If contemplating using 12V for colour television it is imperative that the polarity is correct. Most 12V leads have a grey stripe on one of the two leads which denotes negative.

The distance between the battery and the appliance or lights is important with low voltage electricity. At the moment our source of supply is 30m from the house and running 6mm wire we experience a 1V drop-off for each light used, for example from a maximum of 14.5V the line voltage drops to 11.5V after 3 x 12V fluorescent lights have been switched on.

For safety reasons our 240V wiring was installed by a licensed electrician.

Appliances

Like most people we possessed a number of 240V AC appliances when we built our new home. We investigated low voltage appliances and found that there were a few items available. In particular, most entertainment items, such as television, stereo and keyboard organs could be run off 12V. We found that the range was restricted for items such as washing machines or refrigerators and that local servicing would be a problem. We therefore decided to continue using our 240V appliances through the inverter, except for the following:

1. Iron. Even though we have occasionally used a clothes iron through the inverter forshort periods (the odd urgently needed shirt), the drain on our batteries is unrealistic. Some suppliers state that ironing is possible using alternative energy sources, but this would be restricted to people who have very large solar arrays or wind generators in excess of 2KVA (and the battery banks to go with them). Small systems just cannot replace the power used, so we use our petrol generator and power not used during ironing is bled back through the charger to the batteries.

2. Heating & cooking. Our heating is by the traditional method of a slow combustion stove. We also have a small LP gas stove for summer use.

3. Cooling. we have two 75W 240V AC ceiling fans that have a variable speed switch. High temperatures and sunny weather go hand-in-hand, so there is no drain on the battery bank when using this appliance through the inverter.

4. Refrigeration. Our **Electrolux** fridge is the largest of the three-way fridges made. However, gas is the only current economical power source. We also use a kerosene fridge in summer to store perishables not immediately needed. As the cost of solar panels and fridges continues to fall, it should eventually become economical to use solar power for refrigeration. Some fridge costs have halved in the past 18 months and solar panel costs have dropped from $550 to $400 each.

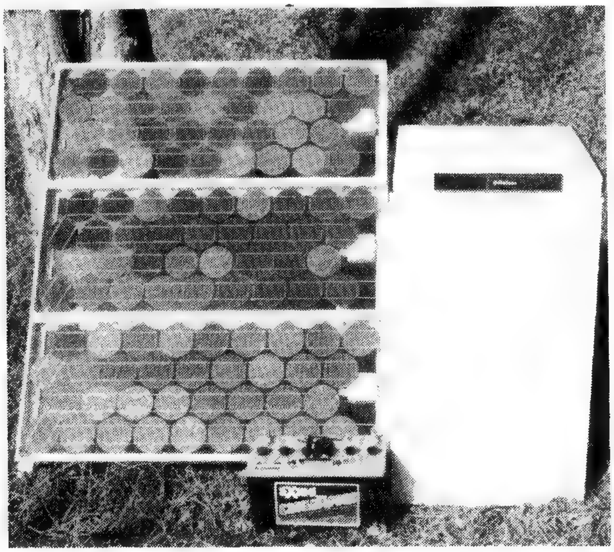
Our power system, though relatively sophisticated, has cost us $3000 less to install than mains electric power. We have also saved on wiring and labour costs. While petrol costs (for the generator) are still high at $5-$7 per week, due mainly to the incorrect height of our wind generator and subsequent loss of power, we hope to eventually reduce fossil fuel costs to $2 per week. It is still going to take a longtime to use up the $3000 we saved and we are not paying quarterly power bills.

Of course we will eventually have to replace the batteries and there may be some equipment repair costs.

On the whole we are very satisfied with our 'off-the-shelf' system and just grin at each other when there are talks of strikes and blackouts.

The family has also become more energy-conscious, realising the need to use power only when necessary.

Chris & Rhonda Martin, "Mullionkale", Timor Road, Coonbarabran, NSW, 2357.



A solar electric refrigerator kit made by Tideland Energy Pty Ltd in Australia for use in Papua New Guinea. Using single crystal raw silicon wafers from Europe, Tideland manufactures solar cells and modules at its Brookvale (Sydney) factory. Other products include solar array frames, voltage regulators, alarm modules, inverters, DC fluorescent lighting kits, water pumping kits, fans and batteries.

Solar panel booster

By Stephen Pascoe

Solar cells convert the sun's light rays (and not its heat) directly into electrical energy. The more available light falling on the cells, the more power they will produce.

An ingenious way to boost the performance of solar cells is to reflect more light on the solar panel. The unit described here, a 37 watt solar panel, was boosted to 55 watts (nearly a 50% gain in performance) by adding reflectors to the sides of the panel.

Adding reflectors to a solar panel increases its peak output and also its sensitivity to low light conditions. Because the available light is being concentrated, the low light threshold (the point at which the panel ceases to produce useable power) is reduced. So a panel boosted with reflectors is less likely to be affected by cloudy weather.

But before you go rushing out to buy the materials to build your reflectors there are some minor disadvantages you should know about.

Firstly, the increase in light levels produced by reflectors is accompanied by an increase in the temperature of the solar cells. Heat produced by low density light amplification does not damage solar cells, but it lowers the output voltage of the panel (this characteristic of lower voltage due to higher operating temperature is true of all solar cells). The practical effect of this is that a boosted panel produces more power (amps), but at a slightly lower voltage.

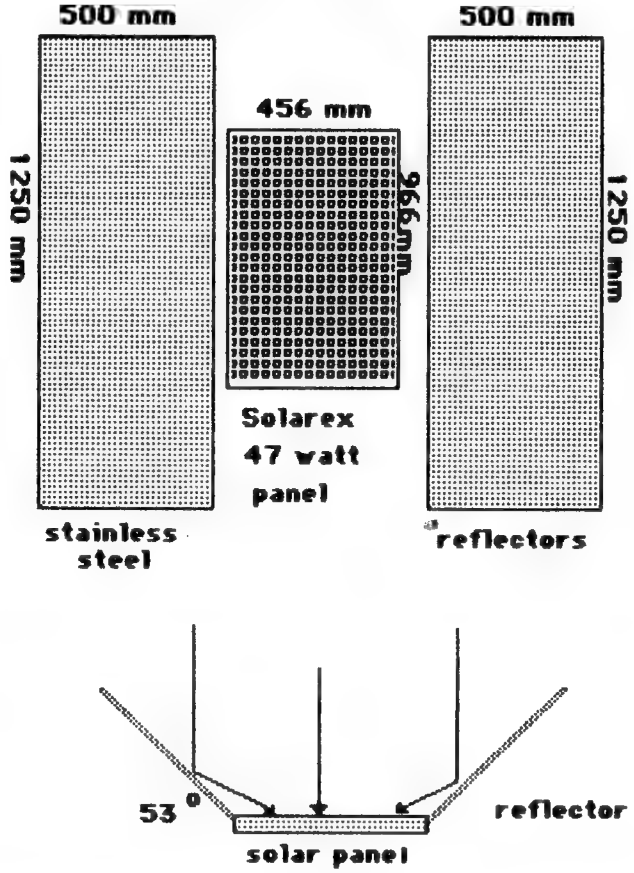
The Solarex panel produced 2.3 amps at 16.2 volts (37 watts) unboosted, but when reflectors were added its output was 3.8 amps at 14.5 volts (55 watts).

This lower voltage could have an effect on battery charging if you have extremely hot weather with no wind to dissipate heat from the panel or if you are losing power from the solar panel to the battery because your connecting cable is too thin.

The reflectors must be solid and secure to withstand high winds and the surfaces must be highly reflective and durable. For our reflectors we used highly polished bright annealed stainless steel sheets (0.55mm BA 304 stainless steel sheets) mounted on rigid non asbestos fibro sheets. Stainless steel proved to be the best compromise when the factors of durability, high reflectance vs low heat transfer and cost were taken into consideration.

The two reflectors were mounted onto the panel with the aid of welded aluminium brackets and constant thread stainless steel bolts.

SOLAR PANEL REFLECTORS



NOTE: Only use aluminium or stainless steel when affixing anything to a solar panel as any other material will react (electrolysis) with the aluminium mounting frame of the solar panel and cause corrosion.

BATTERY SAFETY

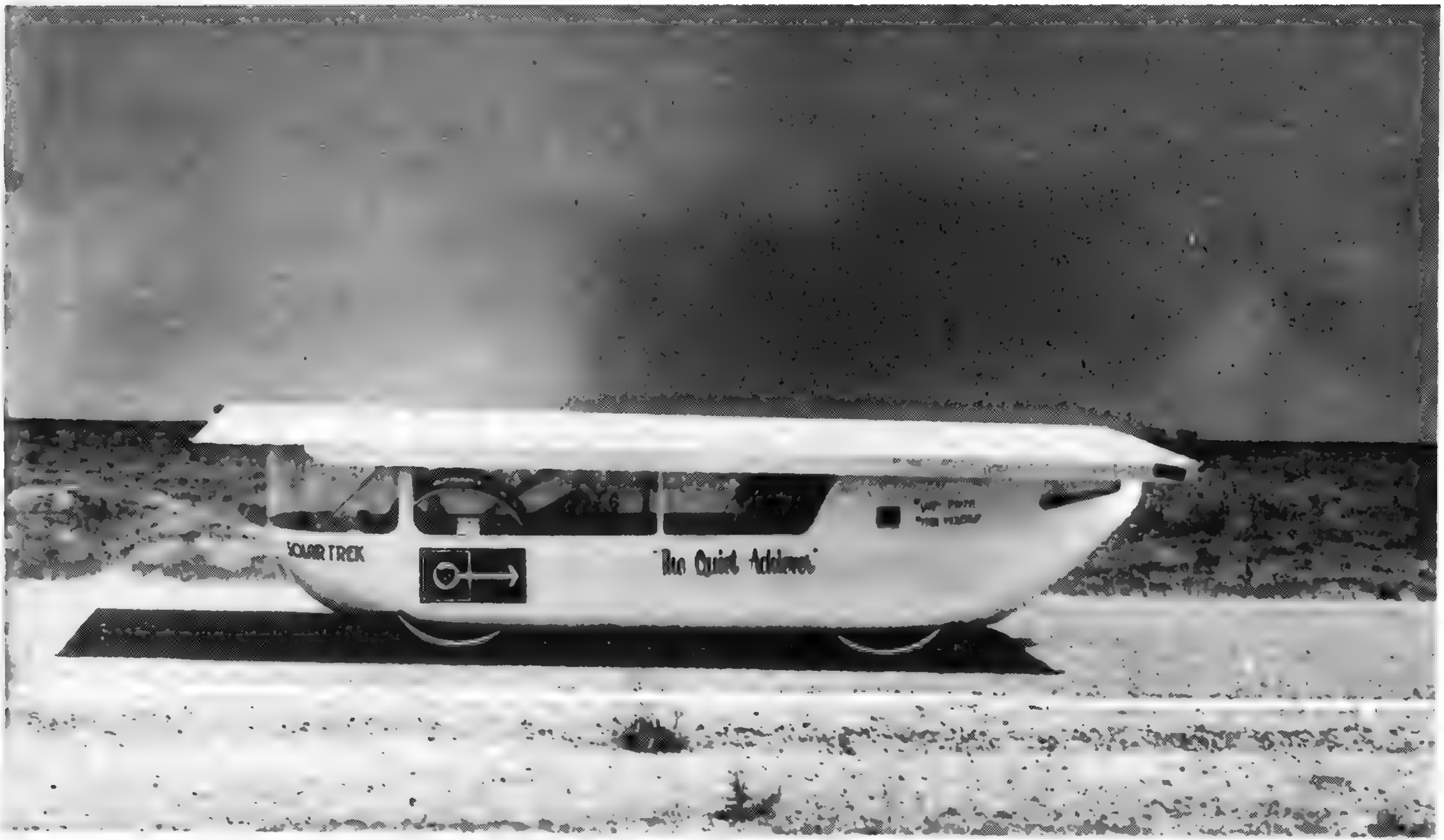
Warning. Scores of Australians suffer eye injuries each year when lead-acid batteries blow up. Many of these need eye operations and a few are blinded. Always approach batteries with caution and wear glasses to protect your eyes.

Don't smoke a cigarette near batteries or your car engine.

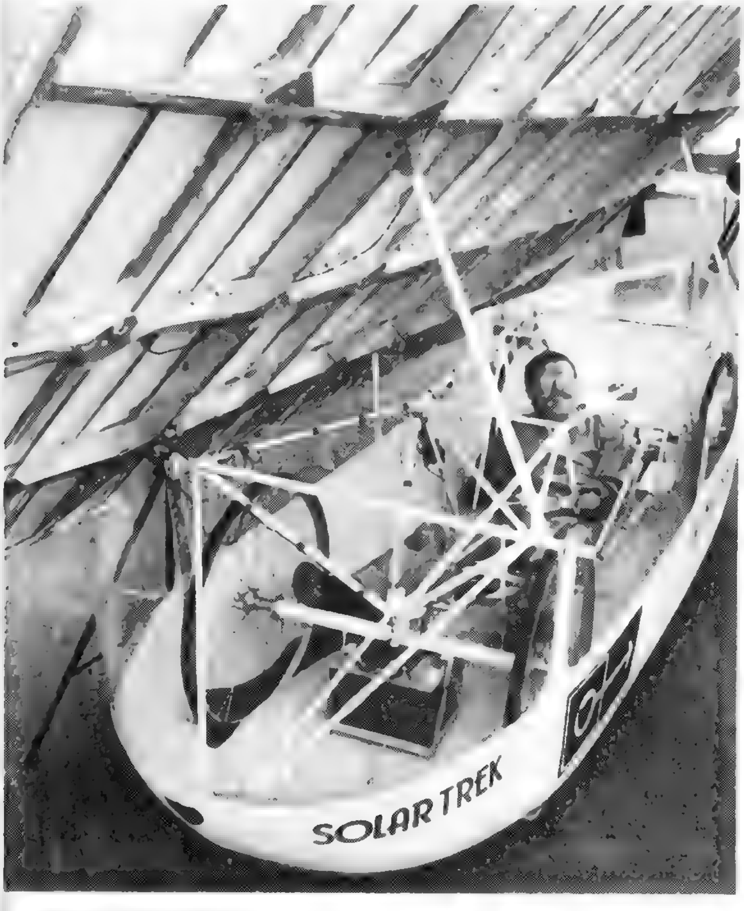
When batteries are being charged, hydrogen gas is produced by the electrolysis of water and will explode violently on contact with air. The smallest naked flame or spark from a match or cigarette lighter or a short circuit will ignite the gas. Short circuits may be caused by spanners or by incorrectly connected jumper leads. In NSW the NRMA has a leaflet, **How to start your car with jumper leads,** which includes safety precautions.

Don't overcharge batteries as this generates more hydrogen and damages the battery. Always charge batteries in a well-ventilated area. Keep battery terminals clean.

Acid. Battery electrolyte contains sulphuric acid which will damage eyes, skin or clothing if spilled or splashed.



RUNNING ON SUNLIGHT



Adventurer Hans Tholstrup and car racer Larry Perkins took just over 20 days to cross the continent of Australia from east to west, a distance of 4084km, driving this little tub-shaped vehicle running on solar power. Despite difficult terrain and weather conditions, the **BP Quiet Achiever** was able to reach speeds up to 45 kilometres per hour, finishing 10 days ahead of its original schedule of four weeks.

They left Scarborough Beach in Western Australia on Sunday, December 19, 1982 and ran into a storm at Northam, just 90km from Perth, that first day. They met temperatures of 38°-41°C in four hot days at the start, then crossed the desolate Nullabor Plain under overcast skies, but there were still sufficient light rays penetrating the clouds to power the solar cells on the vehicle's flat roof.

At the halfway mark at Ceduna in South Australia (eastern end of the Nullabor Plain) on December 29, Hans Tholstrup was able to say: "We are now three days ahead of our schedule due to the solar modules being more efficient than we had expected. Although our average speed is the anticipated 25kph, the additional efficiency permits us to run each day up to 10 hours instead of the planned six hours."

The next big hazard was a dust storm near the outback mining town of Broken Hill in New South Wales, but the 'solar bathtub' rolled on to be greeted by the cheers of the crowd at the Sydney Opera House on a sunny morning of Friday, January 7, 1983, having crossed from the Indian Ocean to meet the Pacific at Sydney Harbour

Tholstrup and Perkins took turns at the wheel, each

Under the raised solar module roof, Larry Perkins sits in the driver's seat of the Quiet Achiever. *Note batteries.*

driving a four hour shift. Larry Perkins, an international Formula One driver who had won the **Bathurst 1000** motor race with co-driver Peter Brock at Easter 1982, had to be content with average speeds of 25 kph. He helped his brother Garry to build the solar vehicle in Melbourne.

Danish-born Hans Tholstrop, aged 38, is the kind of adventurer who believes that there is nothing that can't be done. To prove it he circumnavigated Australia in 1970 in a tiny open speedboat shattering world distance and endurance records. He has flown in a single engine aircraft solo around the world, crossed Bass Strait in a Mini Moke strapped to a rubber raft, ridden a motorcycle around the world in 27 days, crossed Australia from Rockhampton to Perth through the deserts by motorcycle, crossed the North Atlantic through ice floes by speedboat and has several times achieved the best results in car economy runs between Sydney and Melbourne.

The Quiet Achiever

This ingenious solar powered vehicle is built from a lightweight tubular steel frame around which a streamlined body was fitted shaped from layers of bonded fibreglass. The flat aluminium roof is also the 'door' and carries 20 solar cell modules. It is 4m (13ft) long, 2.1m (6ft 11in) wide and 1.1m (3ft 3in) high. It weighs 150kg or 225kg with the driver.

Engine is a 1 HP Bosch direct current (DC) 24 volt motor which drives the rear left wheel by 4 speed chain transmission. Potential top speed is about 45 kph. The throttle is simply the switch which turns the electric current on and off.

It is fitted with four 70cm (27in) diameter racing bicycle wheels made of an aluminium rim and hub and stainless steel spokes. The tyres are Michelin. They did have a couple of punctures and a few broken wheel spokes on the driving wheel during the journey.

Brakes were standard bicycle brakes mounted on the rear wheels. The driver reclined, steering by hands and feet via a steering spool and cable. The solar vehicle has a stoplight and turning indicators, but no head or tail-lights as it was not driven at night.

Solar cells

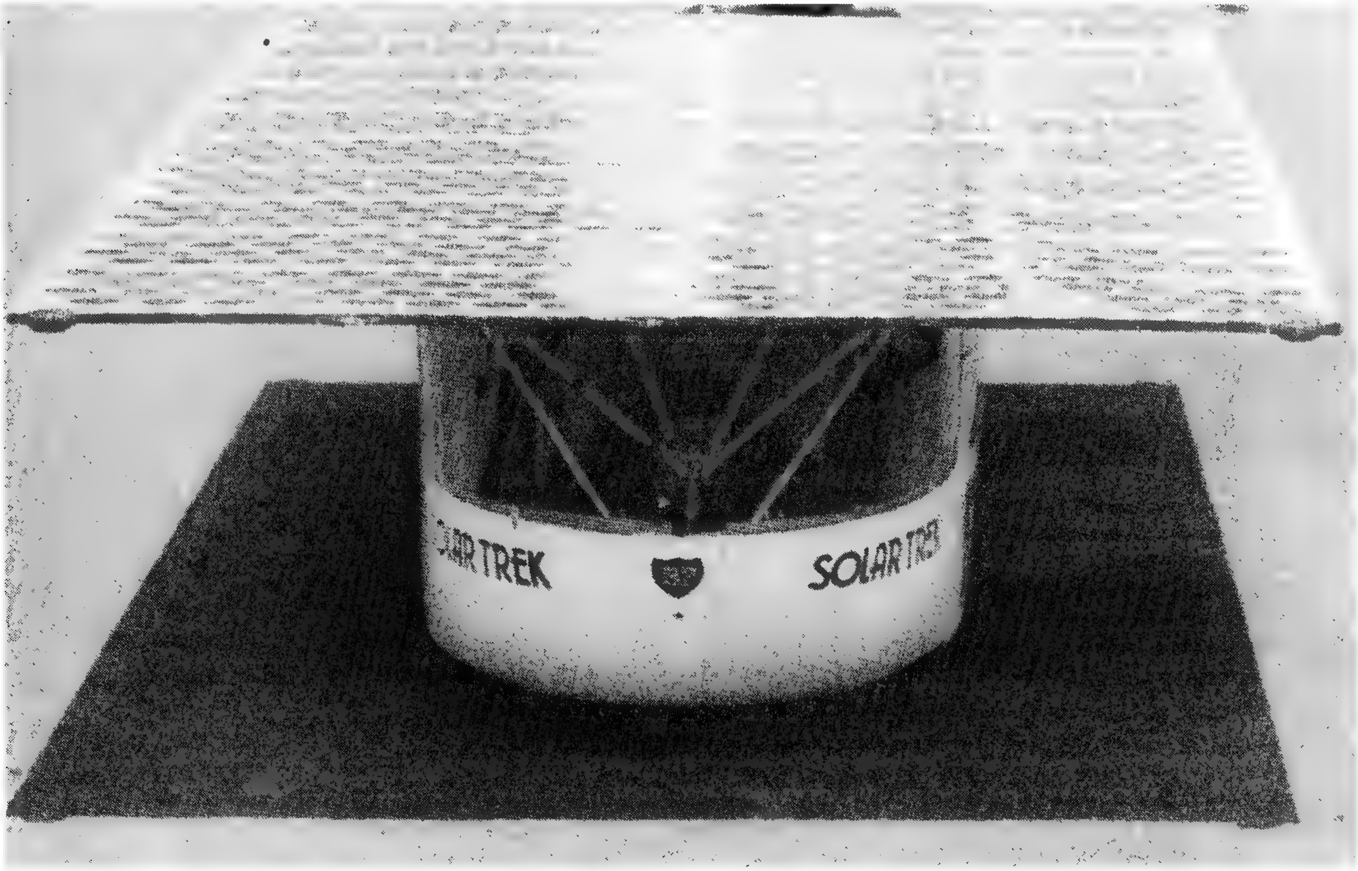
The solar cells were made to a one-off design by Lucas BP solar Systems in Britain, a company now renamed BP Solar Systems Ltd. BP Australia was the main sponsor of the Solar Trek project, which cost nearly £1 million stg.

The flat aluminium tabletop lid which forms the roof of the vehicle carries 20 solar cell modules with a total area of 8.5 sq metres (90 sq ft). Sunlight acting on the solar cells develops a total power of 600 watts (or 0.8 HP) and charges two conventional 12 volt car batteries coupled as a storage unit which in turn supply power to the 24V motor. The batteries also provided reserve power for climbing hills and for early morning and later afternoon driving.

Each of the 20 solar modules has 36 silicon solar cells and each cell is 100mm diameter. Each row of cells is connected in parallel to give 12V electricity while two rows are connected in series to give 24V. The cells are around 11 per cent efficient in converting the sun's rays to electricity.

In ideal conditions of maximum sunlight each solar module gives a charge of 16.4V. When stationary each morning and afternoon, the aluminium module lid, hinged to the chassis, is opened and tilted to the correct angle to charge the two batteries.

"If it will motivate just one more idea and thought in the development of solar power", said Hans Tholstrup, "then the venture will be well worthwhile".



Lindsay Corben with rooftop six solar module array and solar hot water collector.

Homemade power

By Lindsay Corben

We (a couple) use solar electric power for all normal domestic applications in our small home in northern New South Wales, except refrigeration and cooking, for which we use gas — though we do a lot of our cooking with firewood during winter.

We have six photovoltaic panels and two **Besco** 6 volt 230 amp hour (AH) deep cycle batteries, forming a 12 volt 230 amp hour total storage capacity.

Lighting is based on 25 watt incandescent globes and we have about 13 of these scattered about the house.

Power. About nine 12V general purpose outlets with two-pin polarised sockets supply radio, tape player, portable lighting, small vacuum cleaner, 12V electric drill, black and white television and a soldering iron.

A 300 watt (W) **Electronics Australia** inverter, built from a kit, supplies about 11 standard 240V AC power outlets for blender, mixer, electric broom, sewing machine, lamp stand, electric drill and soldering irons.

We do our clothes **ironing** by heating an old 240V iron, with the cord removed, on the gas or the pot belly stove. **Hot water** comes from a **Solarhart** 300 litre solar water system, with a booster, and is quite adequate.

We started about 15 months ago with four solar panels, rated at about 25 watts, manufactured by a small show in Castlemaine, Victoria, which seems to have gone out of business. The panels are non-tracking, but seasonally adjustable and delivered a typical mid-day full sunlight 5 amps, depending on battery condition. By recording current at half hour intervals through a sunny day, it seemed we could expect about 28 amp hours per day, say 0.4 kilowatt hours (KWH) per day, which isn't much by suburban standards, but is a heap better than nothing.

Car engine backup. As other people in this area may have noticed, we have had over 12 months of very overcast weather and, together with the use of the washing machine (see separate story), we had what Bob Hawke calls a deficit. Our back-up was the car, hooked to the house battery by massive scrap copper leads, with a non-break changeover switch in the car to transfer the car alternator from car battery to house battery.

To do this the car regulator has to be rendered inoperative. Fortunately ours is electro-mechanical, so we simply slip a wedge in the gap to stop it closing. This setup does require manual monitoring of charging current, with adjustment by varying the engine speed. The engine speed needs only to be slightly above idling to give 15-20 amps.

The system works, but it is full of traps even for the experienced.

I thought a lot about using hybrid methods to get more energy, but finally a health factor threw me back to the simplest way — more solar panels. We recently installed two **Solarex** 2.5 amp panels and we were delighted to find that they contributed almost as much as the four old panels even though they are slightly smaller. So we have nearly doubled our capacity and following a burst of sunny weather we now have a surplus.

Control of the panels is by a simple **electronic regulator** which turns off the total panel input when the battery terminals rise to 14.5 volts and cuts in again at 13.9 volts. The relay is an old cut-out and works well. At times of low useage and high sun it will click every couple of seconds, which tends to wear me out if not the relay, so I switch off a couple of panels.

Backbone **wiring** of the 12V system is 6mm^2 scrap copper, mostly bare, attached to bearers and joists by clouts. The leakage through dry timber is quite negligible and the clearance needs to be only large enough to prevent accidental short-circuits. Insulated wire is essential in the ceiling space where sisalation is lying around. Joints are soldered for reliability.

Fusing is important and there is a main 45A fuse and several 8 and 15A fuses for sections of the wiring. It is essential to avoid sparks near the batteries, as some nasty explosions have occurred.

Perhaps it is obvious that we have chosen solar energy for other reasons than simple economics, but I would like to point out that a major factor in the economics of low voltage systems is the owner's ability to build the system without the need for legally qualified wiremen. However, there is a large gap between people like myself, with 40 years of electrical work up the sleeve, and someone trying to do the job starting from scratch. **Earth Garden** may help to bridge this gap.

An electric broom

Lisa using the electric broom to clean her mat. The electric broom is a vacuum cleaner with the motor and bag on the handle end and a small sucker at the foot. It is a handy device for use in a small house.

This one is the Model VC20, made by J. Wernard & Co, Meadowbank, NSW, and runs on 240 volts drawing 300 watts (serial no. 8806).

BATTERY CAPACITY

By Greg Baker

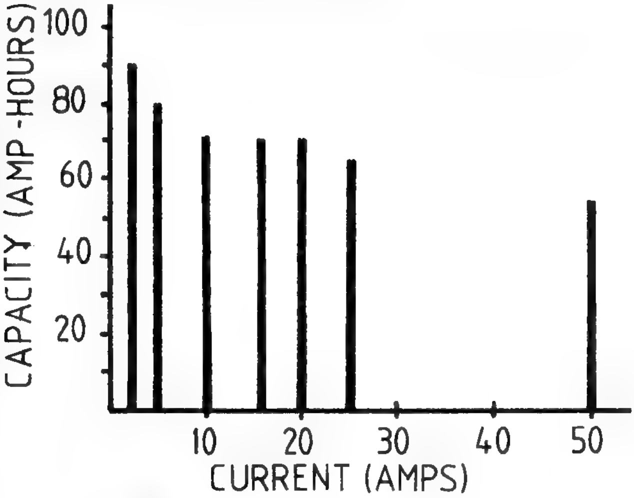
Cells store electric charge. This is measured in ampere-hours (amp-hours or Ah for short). An amp-hour is the amount of charge which would flow through a wire in one hour if a current of 1 amp was flowing.

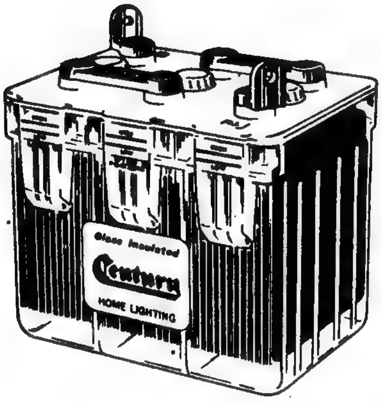
Cells and batteries (which are a collection of cells) are usually given an amp-hour rating by their manufacturers. This is how much charge can be taken from the cell or battery over a particular length of time. Manufacturers should specify this length of time. It is usually 20 hours. Thus a 200 amp-hour cell will give 10 amps for 20 hours.

If current is taken out at a slower rate than the 20 hour rate some increase in output is possible. Hence my example 200 amp-hour cell may give 5 amps for 45 hours, implying 225 amp-hours. How much extra capacity can be obtained in this way will depend upon the particular cell or battery and the manufacturer can give you details.

On the opposite side of the coin, if current is taken out at a faster rate than the 20 hour rate, a decrease in output will result. My example 200 amp-hour cell may give 20 amps for only eight hours, not the 10 hours implied by its rating, so only 160 amp-hours may be available at this rate of current.

As another example, I have used information provided by Besco on their 90 amp-hour 12 volt deep-cycle battery to draw a graph to show effective capacity for seven output currents.





Century PG613 home lighting battery. Transparent container allows easy checking of the state of charge, indicated by a float ball hydrometer.

Using an inverter

By John & Maureen Cooper

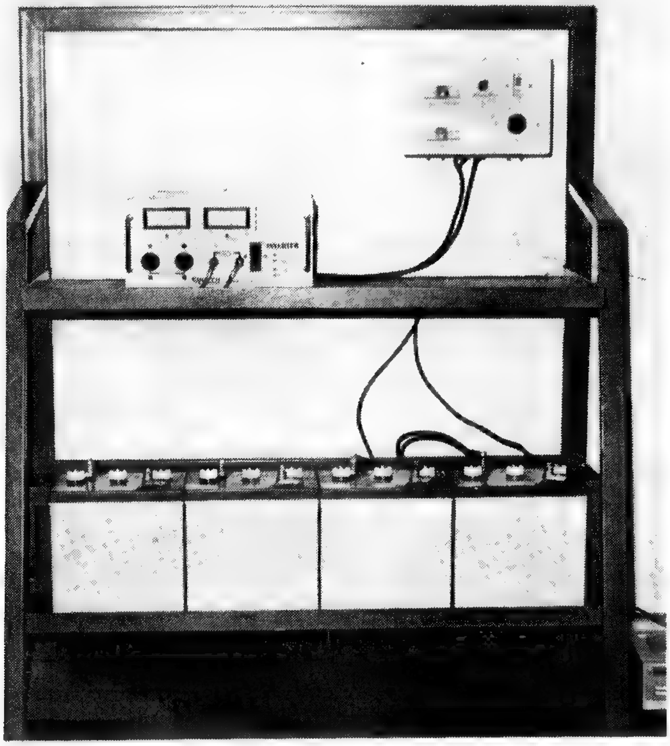
For many years people have been using solar panels and battery banks to produce 12 volt power for their lighting needs, television and sound systems and consequently appreciate the use of efficient, safe, clean and free energy from the sun, as well as the rewards of being self-sufficient and energy conscious.

There is an increasing demand, however, for the production of 240 volt electricity from a renewable, independent power source, which can be operated in a household or on the farm.

We have installed many systems like this on the NSW north coast and in south-east Queensland, which operates successfully in this climate. Satisfied people are using a wide range of appliances including computers and word processors. This is achieved by wiring an efficient, automatic, voltage regulated inverter to the solar electric system. The use of a control board is a good idea, enabling an accurate assessment of the state of the system at a glance.

Fluorescent lighting in 12 or 24 volts is recommended, while the power points are mostly 240 volt, for the use of iron, washing machine, blender, vacuum cleaner and power tools, etc. The use of heating appliances, such as an electric stove, is not economically feasible.

When buying 240 volt appliances, it is wise to choose them in a low wattage rating, for example, a 70 watt iron does the same job as a 1500 watt iron, using half the power.



Santech solid state inverter and battery bank, from Blue Ridge Solar, Murwillumbah, NSW.

A typical installation for a home might consist of:

☐ **6-8 solar panels** on a mounting frame
☐ 500 amp hours (approximately) in deep cycle **batteries**
☐ **control board** (with gauges, meters and circuit breaker)
☐ a 600 or 1000 watt **inverter** and
☐ **cable** and electrical fittings.

These products would cost around $4500-$5000, representing an economic proposition, certainly in comparison to the connection fees to the grid in country areas.

There are many appliances available in 12 volt for a smaller, simpler system, for example solar refrigerator and freezer, colour television, stereo (with turntable), power drill, soldering iron, ceiling fan, high intensity reading lamp and water pumps.

The 12 or 24 volt fridge uses an efficient compressor, using a fraction of the power of a conventional fridge, but it may require up to four solar panels for year-round operation.

As well as selling the best energy products available in Australia, we also import and make some special equipment, such as decorator (coloured enamel) fluorescent lights, amp and volt meters, control boxes and **Santech** inverters.

240 VOLT AC APPLIANCES

Santech Inverters

The Santech inverter is designed to deliver 240 volt power from a battery bank. It is a refined and realistically priced unit, which offers an auto-start device, maintenance free semi-conductors and a DC and AC voltmeter to indicate DC input and AC output.

It also features advanced design (100% solid state), fully regulated output, high conversion efficiency, excellent surge current capacity, continual function and battery condition monitoring with warning lights and audible alarm, modified square wave (quasi-square wave), overload and short circuit protection, quartz crystal oscillation, low wattage load sensing on auto-start, very low standby current, fully warranted 12 months parts and labour.

They are priced at approximately $1 per watt and sized as:

300W, 400W (12 volt)
600W (12 or 14 volt)
1000W, 2000W (24 volt)

We are happy to mail specifications on the inverter, other products and answer any queries.

John & Maureen Cooper, Blue Ridge Solar, 8 Nullum Street, Murwillumbah NSW, 2484. Phone: (066) 72 4033.

ACCESS TO SOLAR ELECTRIC SUPPLIES

Australian manufacturers and distributors of solar cell modules, kits and packaged systems.

Arco Solar. Distributed in Australia by Indian Pacific Solar Electric (IPS), 5 Park Street, Erskineville, NSW, 2043.

Kyocera Corporation (Japan). distributed in Australia by Amtex Electronics, 36 Lisbon Street, Fairfield, NSW, 2165, a division of Telcon Australia Pty Ltd, and at Telcon stores.

Solarex Pty Ltd, 5 Bellona Avenue, Regents Park, NSW, 2143, and through agents.

Tideland Energy Pty Ltd, PO Box 519 Brookvale, NSW, 2100, subsidiary of Tideland Signal Corporation, Houston, Texas, USA. Distributors throughout Australia.

Philips/Photowatt. Philips Electrical Components and Materials, PO Box 50, Lane Cove, NSW, 2066; 55 Forbes Steet, West End (Brisbane), Qld, 4101; 1092 Centre Road, Clayton (Melbourne), Victoria, 3168; 113 Tapley's Hill Road, Hendon (Adelaide), SA, 5104; 1 Frederick Street, Belmont (Perth), WA, 6104.

Agents for solar cell modules and solar electric systems.

Alternatives, 37 Bangalla Street, Torwood (Brisbane), Qld, 4066.

Blue Ridge Solar, 8 Nullum Street, Murwillumbah, NSW, 2484.

Going Solar, 320 Victoria Street, North Melbourne, Victoria, 3051.

Jym & Karen McPhee, 91 Mayne Street, Gulgong, NSW, 2852.

Mudgee Natural Energy Home, Lot 23, Tuckermans Road, Menah, Mudgee, NSW, 2850.

Natural Energy Centre, 34 Casino Street, South Lismore, NSW, 2480.

Natural Technology Systems, 120 Prospect Road, Prospect (Adelaide), SA, 5082 (formerly Village Alternatives).

Nimbin Emporium, Cullen Street, Nimbin, NSW, 2484.

Outlook Alternatives, RMB 9010, Wangaratta, Victoria, 3678.

Quirk's Victory Light Co, 16 Court Road, Double Bay, NSW, 2028.

Self Sufficiency Supplies, Shop 3, Cnr Clyde & Forth Streets, Kempsey, NSW, 2440.

Solar Charge (John Paton), 122A Martin Street, Gardenvale (Melbourne), Victoria, 3185.

Sunstream, 17 Giselle Street, Wyoming, NSW, 2250.

Survival Technology, 66 Maroondah Highway, Croydon (Melbourne), Victoria, 3136.

LOW VOLTAGE WIRING

By Peter van der Wyk

I have some comment on Greg Baker's **Low voltage wiring** article in **Earth Garden 43.** I prefer to work out my voltage drop from first principles rather than a set of tables.

The formula is: Voltage drop $= L \times I \times R \div A$

where A = cross sectional area of cable in square millimeters
L = length of cable in metres (from appliance or charging system to battery and back again)
I = current measured in amps
R = electrical resistance of wire, which for copper is 0.017, for aluminium is 0.028 and for steel is 0.19.

The standard wire sizes are:

mm^2	strands	mm^2	strands
1	1	25	19
1.5	1	35	19
2.5	1	50	19
1.5	7	70	19
2.5	7	95	37
4	7	120	37
6	7	150	37
10	7	185	37
16	7		

Anything above 16mm^2 starts getting very expensive and would not be practical in most 12 volt uses. You can get automotive cable in about the same sizes but with many more strands and therefore greater flexibility.

It is really important to ensure good contacts and joints throughout your electrical system. Although copper is a good investment (like silver or gold it always retains a good resale value), there is no point in putting in expensive copper cables if you still end up with a significant voltage drop because of poor connections.

Permanent connections and cable ends should always be soldered. A screw or clamp fitting is ensured better contact onto solder than onto copper, aluminium or steel as these metals tarnish with exposure to the atmosphere and then gradually produce more and more of a voltage drop with age.

You should make sure that all plugs, sockets, switches and other temporary contacts are not tarnished. File them clean if they are. With 240 volts a little voltage drop is not noticeable but with 12 volts it can be quite significant. A little bit of petroleum jelly (vaseline) may be used to slow down tarnishing and corrosion.

You don't have to use insulated wire for a 12 volt electrical system inside a house. You can use bus-bars or positive and negative metal strips screwed to the walls and isolated from one another by physical distance. As there is no danger of electric shock, there is no need for emphasis on insulation.

Self-serve greens

By Greg Baker

The story of the greens begin with some ducklings you attempt to raise on pollard and water. Someone told you that's what they eat. But after a few weeks the ducklings can't keep their heads up and keep falling down.

It gets a bit tedious propping them up in corners and against walls, so you do a bit of reading and discover vitamin A. You also discover that those clever little birds can make the vitamin A themselves from green feed. So being a good, beard-toting back-to-earth type you decide that greens must be the best way to get vitamin A to your poultry.

Anyway, after a bit of fun trying to breed the new, revolutionary quackless duck ("for a better night's sleep"), you decide to leave those oh-so-hard-to-pluck animals behind you and move into chooks. The ducks never did get around to laying anyway.

Not working the 9-5 grind you are free to do a bit of reading to fill in those long hours on your hands between meals. You find two ways to get greens to those scrawny scratchers and decide on the first method, to cut the greens and take it to them.

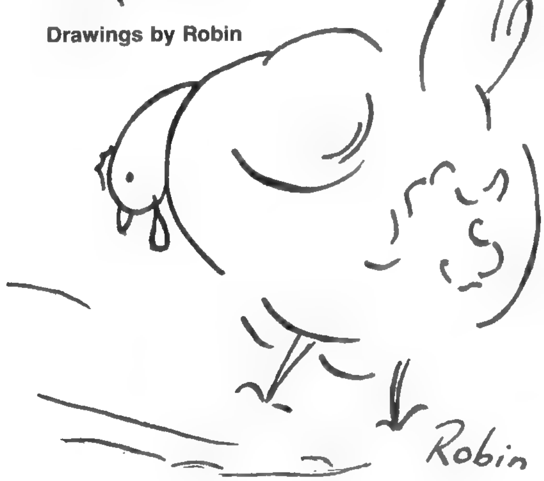
You get out amongst the foliage with a sickle, seizing your back bending over or wearing the knees out of your trousers bending down. Or you buy a scythe (and grow a long white beard).

On the first day out, with all your friends and relatives to cheer you on, you find you can't work the damned thing. You bend the grass down for a while, then start digging the point into the earth and end up bending the blade back against the handle. Then you send back the correspondence school's "Three minute way to expert scything" course and throw their scythe into the nettles and blackberries behind the dairy.

Not to be beaten, you crawl around on hands and knees with a pair of scissors raided from the sewing cabinet. You cut and tear and shred a great stretch of grass and then grovel about collecting it all together. You take it to the chooks and present it to them triumphantly. They scatter in alarm, ignore the offering at first, then condescend to look it over.

They next proceed to peck it around the yard and trample it under claw. Or they run around with bits of it in their beaks looking furtively over their shoulders fearing another chook will snatch it from them. If it's not broad, green and lush they turn their backs and return to whatever they were doing before you interrupted them.

Drawings by Robin



You return to the house for a rest, a cup of coffee and a shoulder to cry on knowing that you'll only have to do this seven times a week for the rest of your life.

After a bit the weather turns cold and your knees turn blue with the icy draught through the holes and your backbone goes brittle and creaks as you get down to cut the frozen greens. Your sewing friend can't patch your trouser's knees because the scissors have vanished and you daren't say where they went to.

Well, to cut a long story short, while recovering from the frost bite and the nervous breakdown you drag out those books and magazines (both of them) and do a bit more reading. You rediscover the forgotten second method: let those feathered ingrates get it for themselves. Let them get cold feet and sore backs; just sit back and let them get on with it.

The first day out of bed you work like a Trojan and build them a big run around the orchard, just like in one of your back to earth how-to manuals. You turn them in with a sigh and shout "Righto. Get on with it you blighters. Clean up the grubs and rotten fruit. And get your own greens."

And you go back inside to re-establish relations with your one-time friend who has just discovered where the scissors went to. It seems you gave the game away in your delirious ramblings during your breakdown. After a couple of hours you parley, promise never to go near the sewing things again, not even to look sideways at them, and go out to see how the chooks are getting on.

You told them to get on with it, and they have. One little huddle has scratched out the roots of your most recently planted fruit trees. In a corner of the yard a group of hens has completely bared the ground and you can see the sun sucking the moisture out of it. A third group sits ruffling their feathers in a dust-filled hole where the red currants were two hours before. And that horrid grey and white scrawny one is up the plum tree pecking holes in the only three fruit you've seen on it in the six years you've been there.

The rooster and the hen named Bruce (for reasons you'd rather not discuss) are doing some sort of dance on their bare piece of earth, packing it as hard as concrete.

As you arrive they all look at you in a bored way, turn their backs on you and get back on with it. You feel another breakdown coming on as you leap the fence in a single bound and you scream and wave your arms at them until they scurry back to their shed where you lock them in without their supper.

So you think: *I won't let this great idea be spoiled by these small-brained chooks.* You then spend a fortnight with the tractor and trailer moving rocks to mulch the trees to keep their talons at bay. Or you take the truck to town and load it down with mesh and steel posts paid for from your fast-dwindling cash reserves. The trees are protected, but the blighters still bare and pack the earth, pile all the vegetable matter along the downhill fence and go after worms in the erosion gullies formed in the next big rain.

Not to be beaten you pawn your mouldboard plough and put in a really big run, which is fine, but your eggs have cost the earth — if you can find where they've laid them this week (and the ravens and currawongs haven't found them first) — and the chooks still have their favourite areas for destruction.

You sit down and think, as you do so often these days. *There must be a better way.* Because your brain is only 100 times the size of a chook's it takes a long, long while to get exactly nowhere.

In the end your friend takes pity on you and tells you what to do. It seems your friend worked it out long ago but thought it would be good for you to do it by yourself. Still staggering from that blow you sit and watch while the ex-friend drags some steel reinforcing mesh from the shed and throws it at your feet. They bend 200mm of the mesh up square on each edge to make a shallow box without a lid. You emerge from your daze and help turn it over.

"There," says your friend. You decide to humour them. "Yes, lovely. But what do you want me to do with it?" The light begins to dawn, you think, as you help to stretch 12mm chicken wire over it and wire it on. Your friend says that reinforcing mesh with closer spaced rods would be better if you had some. It would save on chicken wire and the effort of wiring it on. You mutter in agreement as though you'd already thought of it yourself and you were really sure you knew what it was all about.

You drag it to the chook run and are amazed that it fits through the door. You dare not ask whether it was deliberate or accidental, just hold one end while your friend broadcasts some oat seeds, mulches it and puts a couple of bricks in the middle to hold it up.

Let's face it, you live with a genius. As the oats grow up through the mesh the chooks walk around on it pecking off their own greens and dropping manure on the crop. Because the mesh size is so small they can't get their necks through to eat it down to the roots. They can't scratch it out either and can't get underneath since you've cleverly put sides on the mesh box.

The chooks have their run too, so they're not always on the wire. The blighters don't rush in and eat the seed as you plant because you (i) lure them away with a pile of their own and (ii) get the kids to keep them off, or (iii) breed the tendency out of them by shooting transgressors.

You make a second mesh box for when the first crop is nearly finished and look out Department of Agriculture recommendations on what crops to sow and when, ignoring, of course, the suggested chemical fertiliser. You iterate from half a square metre per chook to the optimum frame size by noticing whether they keep up with the growth with a little to spare. If it gets away from them they trample it down and waste it.

You've finally done it. Well, your friend finally did it. And it took only six months, three pairs of trousers, a nervous breakdown and weeks of strife. Not bad really, for a failed economist. Not bad at all.

Good food ...

Michael Boddy is a big, jolly man, known as a talented actor, playwright, author, broadcaster, food writer for *The Australian* and cook in the kitchen at the well-known Boddy Towers.

In Michael's own words, "vegetables and sausage making seem to be the stars in this volume". His *Good Food* Book covers vegetables, common and rare (as well as fish, poultry and eggs) and methods of preparing them to eat, with interesting asides on the origins of the food, its quality and nutrition.

The recipes are varied, but simple and straightforward and the hints are useful. But best of all, this is also a very funny book, stuffed with humourous anecdotes like the Great Sausage Saga and a delight to read as sheer entertainment.

Big man, big heart. We would like to take this opportunity to acknowledge and thank Michael Boddy once again for his generous help and encouragement, by supplying us with articles (free of charge) when we were starting *Earth Garden*. His ratatouille (EG7) and review of *The Tassajara Bread Book* (EG6) remain classics of their kind.

Michael Boddy's
Good Food Book
Drawings by Janet Dawson Boddy, Nelson, Melbourne, 1984, paperback, 188 pages. Recommended price $10.95.

For the last ten years Janet and I have been farming, which means that much of the information has been gathered by sometimes bitter personal experience, and most of the ingredients I discuss have been bred, grown, culled and killed by us at Boddy Towers.

* * *

Cucumber cold soup

One of the most romantic and delicious soups I have ever had was a chilled, pale-green jelly with flecks of mint in it. A *consomme* base was simmered down until it would set like jelly. Any fat was carefully removed. Cooked cucumbers were chopped up, mixed with the warm stock and made into a *puree* in the blender. A suitable proportion in this soup would be two cooked 20mm cucumbers per litre stock.

The mixture was seasoned, mixed with some finely chopped mint, and left to set in individual glasses. The little jellies were chilled just before serving.

...& good health

Herbalist and naturopath Dorothy Hall walks the path of reason and commonsense in her latest book which explains the causes of many common problems of our bodies and how we can prevent ailments by eating the right foods. A helpful section covers modern day stress, which Dorothy prefers to call 'loading'.

What's Wrong With You?
How natural therapies can help
Dorothy Hall, Nelson, Melbourne, 1984, large format paperback, 200 pages, illustrated, Price $14.95.

Without silica-rich foods in our diet, we are going to grow increasingly larger, heavier, and weaker, until our bodies will collapse with alarming suddenness under physical loading.

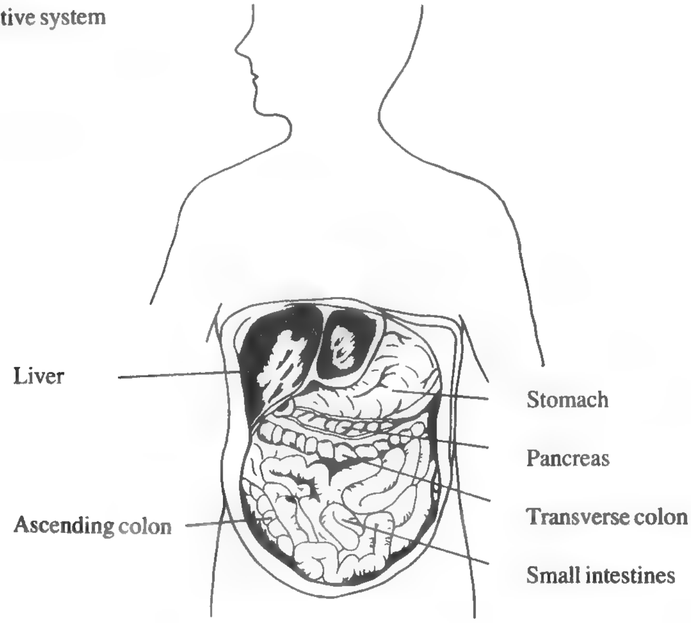
. . . Avoiding arthritis may be as simple as buying a grain-grinder and making your own muesli from *whole*-grains, sheaths, husks and all; using tahini (ground up whole sesame seeds, almonds and other seed foods) on our bread instead of butter or the most newly-advertised polyunsaturated spread; cooking highly nutritional loaves, cakes, pastry shells, biscuits, etc, using flour containing *all* the grain, not just the soft central, carbohydrate part; buying (or writing!) a book on, say, *One Hundred Ways to Serve Turnips;* consulting food lists for other vegetables and fruits high in silica.

* * *

Another way to add snap and bounce to muscles is to eat a nutty-flavoured porridge made from a combination of millet and linseed grains, as a change from the high vitamin E of oats or buckwheat. Such a *simple* thing good health can be!

In winter, make thick porridge your daily starter, hot, comforting, filling and energy-packed, and collect those B and E vitamins, iron, phosphorus and so on from the grains used.

Digestive system



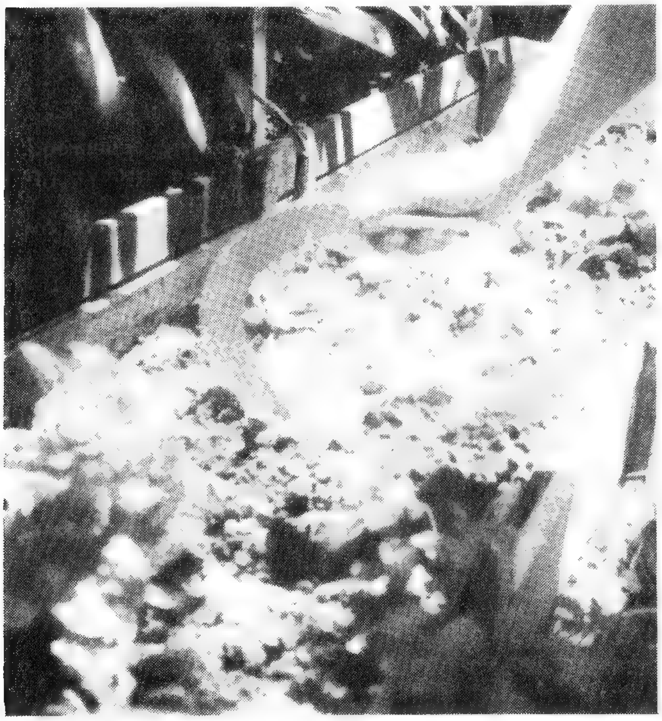
a mixed bag

BIO-GARDEN GRUBBER

- $10.00 posted from Harry Kurth, PO Box 561, Atherton, Qld, 4883.

Harry Kurth discovered the garden grubbing tool pictured at a meeting of organic growers at Offenbach in Germany last year. After returning to Australia, he had 50 made up and they were sold within a few weeks. Now he is offering a new batch of 200 grubbers to organic gardeners who read this magazine.

The rugged tool loosens and aerates the earth without changing its structure, so encourages micro-life in the soil. A handle of any conventional length may be fitted (we haven't had time yet).



TUCKER

By Gordon Bohlin

Freezing capsicums

Cut capsicums up and you can freeze them without blanching. Good when defrosted for stews, braising and casseroles. Have a look in your recipe books, there are plenty of ways to prepare stuffed capsicums.

Cole slaw

Try a cole slaw of shredded cabbage mixed with some capsicum sliced in rings and coarsely-grated carrot, fresh from the garden. Prepare a dressing made with a clove of garlic chopped and mixed in 1 part vinegar and 2 parts new vegetable oil with a little salt and ground black pepper. Make enough to fill a large cream cheese glass threequarters full.

Put the lid on and shake it all together. Let it stand for a while. Chill cole slaw in the refrigerator and pour the dressing over the lot and toss well (better if you have a large bowl with a tight lid) 10 minutes before using. You'll find it hard to imagine how you enjoyed the same kind of cole slaw after buying the ingredients from the supermarket.

COUNTRY LIVING COURSE

Six month courses, spring 1984-autumn 1985.

Now that our beautiful *Outlook Farm* building is nearly finished, with accommodation for 20 residents, we are able to offer our six month country living course.

The intention is to establish an intensively-cultivated small mixed farm on our 6 acre property, which will involve clearing and preparation of land; maintenance and use of equipment; vegetable, small fruit, fodder crop and herb cultivation; care of poultry, goats, pigs; building hothouse, fowl houses, woodshed; shelter belt planting; landscaping and ornamental gardening; storage and preservation of produce and sale of strawberries and excess vegetables.

There will also be visits to neighbouring farms and a few paid jobs when available. Participants will be expected to keep records and should finally gain a certificate testifying to at least 500 hours of satisfactory practice in small farming.

A co-ordinator and a roster of six experienced small holders will supervise each morning, leaving afternoons free for individual activities. To be eligible, applicants must be over 18 and receiving unemployment benefits or the equivalent. There is no charge for the course but full board is available for $35 per week, or less, depending on the farm's production.

There will also be a few places available for applicants willing to put in 20 hours a week in other useful ways such as cooking and housework, maintenance and office work.

Ring or write for more information, or come and visit us at *Outlook Farm,* Mt Slide Road, Kinglake, Victoria, 3763. Phone (057) 86 1285.

Helen Meggs, Honorary Secretary, Outlook Farm Trust.

The Fragrant Garden

- Autumn Catalogue, 1984, $2.00 posted from:

Portsmouth Road, Erina, NSW, 2250. Phone: (043) 67 7546.

Our apologies to Jan and Michael Bailes for not including their address with our mention of their new catalogue in *Earth Garden 43,* and thanks for the lovely bottled perfumed oils (and the aphrodisiac pillow — totally unnecessary!) they sent us despite this grave slipup. Highly recommended.

Visitors to their beautiful herb garden at Erina will find the herb-roofed mudbrick gallery greatly expanded and a dome-shaped mudbrick dunny which looks like an old fashioned bee skep.

earth people write

Dear Irene & Keith,

My wife and myself have 5 acres at Warnervale on the NSW central coast and we are going to set up an alternate building centre which will consist of three dwellings. The first is a 12½ square post-and-beam mudbrick house, using recycled materials and solar power (nearly at lockup stage). This will include sandstone floor, bush rock fireplace and solar hot water system. The second stage will be structural mudbrick, with an organic garden, a small nursery selling herbs and a mudbrick bookshop selling self sufficiency books, etc. The third stage will be a rammed earth building with roof trusses cut from block cypress logs.

I have been a builder for nearly 20 years, the last eight years self-employed and have a lot of experience building the great Australian nightmare, people's houses. During this last recession Irene and I lost most of what had taken us 20 years to accumulate. Now I want to build houses people can afford and also participate in building and also to warn them about the pitfalls involved in taking out large loans. Our aim is to cater to people who have small acreage or normal house blocks. We are willing to help others and would like to hear from people interested in building in this area.

Denny & Irene Prebble, 37 Wyreema Road, Warnervale, NSW, 2259.

Dear Irene & Keith,

The season is progressing like clockwork. There's some rain almost very day, interspersed with brilliant sunshine. The compost is making itself with the help of an earthworm population explosion and we have no frost. Most of my goat babies are female and the vegetables are abundant. I am very ill-at-ease about all this good fortune and can only hope for a small disaster to restore 'normalcy'.

Keep up the good work, Sheila Carron, Wooroloo, WA.

Hi Keith & Irene!

I've made use of a tip today from **Earth Garden 17.** I've wrapped wet cloth sprinkle with Epsom Salt around the trunks of our apple trees. Hopefully, we'll have no codling moth this year. It usually destroys all the apples. Will let you know if successful.

We would like to know of anybody's experience with solar dryers, especially with drying fruit, for example apricots, pears and peaches.

Yours sincerely, Julie and Alan Chamings, 3 Royston Road, Woodend, Victoria, 4332.

Dear Irene & Keith,

My fiance and I are planning to build a mudbrick house and various outbuildings. In preparation for this we would like some experience in the form of helping hands to other muddies in the process of building this summer. We would love to hear from anyone in NSW who would be willing to have two sets of hands for weekends or possibly a week if worked out in advance.

Ok & Fowler, 96 Rutledge Street, Eastwood, NSW, 2122.

Hello,

I do wish to say I enjoy reading the books and have had a pleasurable experience in composting my back gardens with Esther Deans' **No-dig** method. At first the neighbours were laughing — but now wish to know the secret of growing everything so well, with no weeds.

Love and peace, **Rhondda Shaw,** Toowong, Qld.

Dear Keith & Irene,

Many thanks for my autographed copy of the **HARD TIMES HANDBOOK.** It has been, among many things, a brilliant conversation piece. I'm sure some of my friends think I'm on the brink of poverty when they see it on my kitchen table and can't understand why I find its wealth of information and tips as handy as a dictionary.

We are finally about to begin our life's biggest adventure — moving to Cooktown to live off the land and be as self sufficient as we're capable of! For seven years we have worked, saved, invested (even built ourselves a large catamaran and cruised the east coast for 12 months) until we found where our future peace and happiness lies. Now that chapter closes and a whole new ballgame gets under way. We are looking forward immensely tot he articles and information on solar electricity for household appliance use.

Thank you both for your truly amazing contribution to enlightening the many folks like us who stumble along, vaguely knowing where they are going but not sure how to get there. Keep up the wonderful work.

Sincerely, Trisha & Brian Crockford, Eimeo, Qld.

Dear Keith & Irene,

Thank you for your wonderful, refreshing magazine. I enjoyed the Hard Times issue so much and look forward to Hard Times Handbook. I find a real satisfaction in simplifying our lifestyle and look to your book to show me even better ways to do so.

Blessings and warm regards, Jeanne Meixner, Mt Isa, Queensland.

Dear friends,

Born in Yorkshire, but living most of my life in New Zealand, I'm a practical type to whom your principles have great appeal. I have come to live permanently in Redcliffe, have just papered my house and am planting my garden to my liking with lots of fruit trees, including grafted avocadoes and a lychee. Though a widow of 70, I'm full of energy and ideas and will be answering a few of the letters in **Earth Garden.** Perhaps I could help someone with fruit or small animals if they write to me? I would like to learn to milk and to handle bees.

I am a life member of the Youth Hostels Association and still travel and stay in hostels, having just returned from several up north, including the new one at Cape Tribulation. I am a non-smoker, non-religious, almost vegetarian and don't take any drugs except tea and coffee. Redcliffe is a placid little city of 34,000 on Moreton Bay, 20 miles north of Brisbane. Anyone could call in for a cup of tea or a chat.

Someone in an earlier E.G. asked for a supplier of nemophila seeds which I also found hard to locate, but got from **Watkins' Seeds,** New Plymouth, New Zealand. About $A1.50 a packet.

Sincerely, Phyllis Newell, 4 Jeffrey Street, Redcliffe, Qld, 4020.

Dear Irene and Keith,

Would anyone have put into practice natural farming based on the book **One Straw Revolution** by Masanobu Fukuoka? If so we would like to hear from you. We have just purchased 3½ acres at Clunes and hope to establish these ideas on our land. Anyone else is welcome to call for a cuppa or a chat.

Harry & Ilda Chatterton, 58 Talbot Road, Clunes, Victoria, 3370.

PERMACULTURE DESIGN

An intensive two week course in Permaculture design will be taught by Bill Mollison, author of the **Permaculture** books, at Stanley, Tasmania in January, 1985. It will also take in alternative financial and legal strategies for individuals and groups and skills needed for urban and rural situations.

Contact Reny Slay, PO Box 96, Stanley, Tasmania, 7331. Phone (004) 58 1142.

Earthways Farm Solar water heater

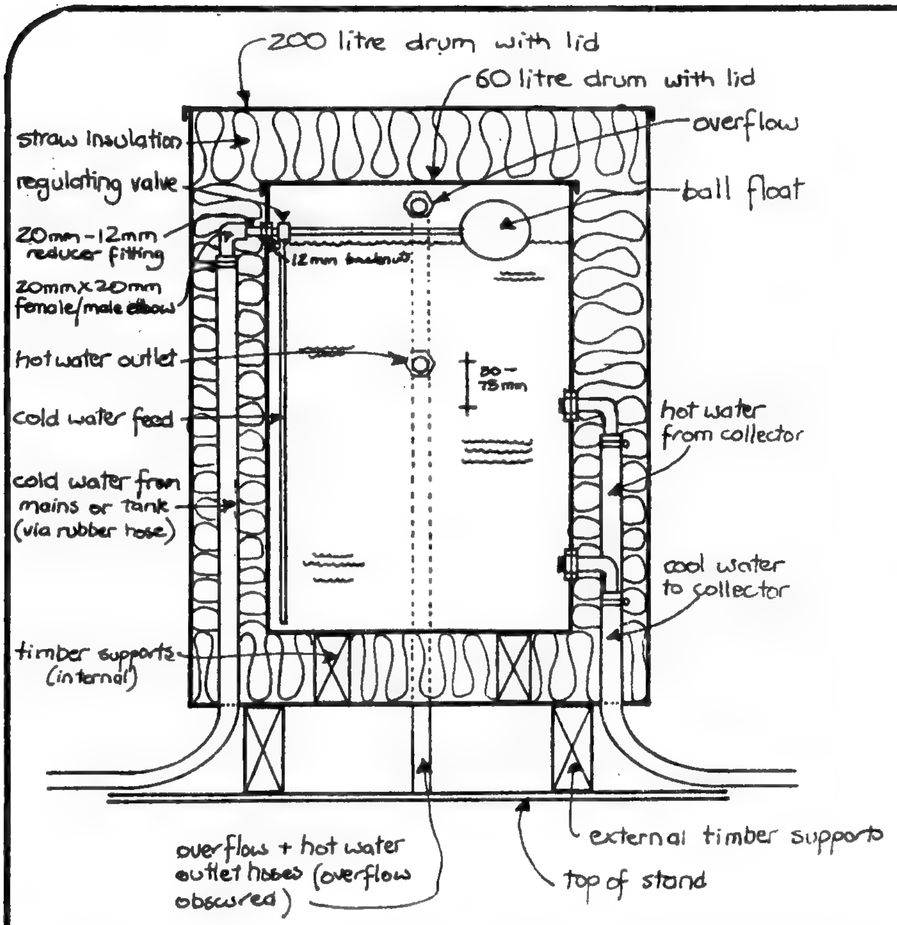
Wayne Kozur & Matthew Parnell, Earthways Farm, 1983 (revised), large format paperback, 32 pages, illustrated. Price $5.30 posted from Earthways Farm, Wollombi, NSW, 2325.

Although a number of commercial firms manufacture solar water heaters, these are generally sophisticated, require a large initial outlay and are geared to provide the full suburban amenity, usually on a mains-pressure basis. As an alternative the solar water heating system described herein has been designed to be easily constructed by the home handyperson using 'appropriate technoloy' tools and techniques, and low-cost, readily available materials.

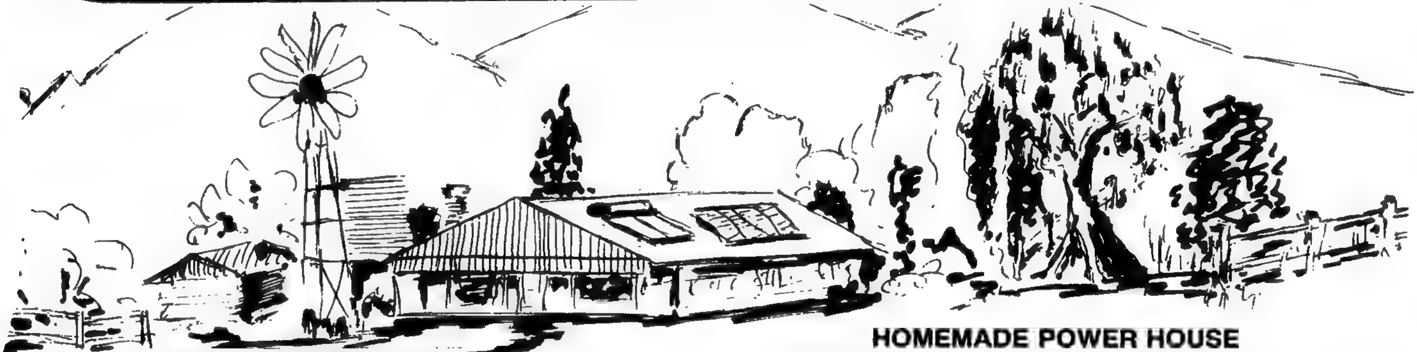
* * *

In Sydney, this solar water heater can provide from 60 to 100 litres of hot water per day at a temperature of 25°C to 65°C, depending on the weather and the season. The system can also provide a reasonable overnight carry-over in sunny winter weather and more in summer, depending on usage. The cost, using all-new materials, is $150-$200 (1982) and around $100 if some components are obtained second-hand. The labour time or the complete assembly of the plate, casing and storage tank is 30-40 hours, using hand tools. More time and money is necessary to integrate the system within a dwelling.

* * *



Build a cheap, low technology (no soldering or welding) solar water heater from these detailed plans — and learn about the workings of solar power as you go.



INSULRITE INSULATION

- From Natural Energy Centre,

34 Casino Street, Lismore, NSW, 2480. Phone: 21 4959.

Insulrite is a loose fill cellulose fibre insulation made from recycled newspaper to which Borax and Boric acid have been added. The Borax gives the material vermin resistance and the Boric acid makes it fire resistant. A 15kg bag covers apprx 7sq metres at 100mm thickness, with an R-rating of 2.5, and retails at $19.00 per bag, FOB Lismore.

"After much looking I have come to the conclusion that this is the only insulation product that is environmentally squeaky clean," says John Muldoon of Natural Energy Systems. "We install it by pumping it into the ceiling with a machine, but it can be easily installed by hand just by tipping in between the ceiling joists and levelling off."

HOMEMADE POWER HOUSE

37 Bangalla Street, Toowong (Brisbane), Qld, 4066.
Phone: (07) 371 6994.

Adrian Hogg of *Alternatives* is opening an energy saving house to demonstrate that "solar and appropriate technologies are not an idealistic dream but viable now. technically and economically".

A private mid-Victorian Queensland house, 3km from Brisbane GPO will be converted to solar electricity and other renewable energy systems so that it is totally energy self sufficient. The SEQEB will be disconnected!

The garden will demonstrate edible landscaping techniques so chemical-free fresh vegetables, tropical fruits and grains are available to reduce outside food energy requirements to a minimum. Wind generators, compost hot water systems and solar ovens will be displayed.

Low voltage appliances

By Peter van der Wyk

I read the short letter from Jeanette Hutchinson in **Earth Garden 43** (page 11). She asks about converting a 240 volt fridge to 12 volt and if anyone has invented a 12 volt iron or washing machine?

The main problem about becoming self-sufficient with energy needs, particularly electrical, is that most people have no idea how much power different appliances require. It is all very well to try to make everything that used to run off 240 volts AC (alternating current) operate on 12 volts DC (direct current) instead. The biggest obstacle to this approach is the size and the cost of the charging system to cope with the amount of power used by all these gadgets.

Most washing machines run on a ¼ horsepower motor, which for a 12 volt system is equal to 16 amps. In comparison, a reasonably bright 12 volt light draws 1-2 amps, a portable black and white televison set draws 1 amp, a modern small portable colour TV draws 2½ amps while a portable stereo cassette player and radio would use about 0.1 amps. My portable computer uses 0.05 amps.

As you can see from these figures, it is quite easy to set up a system to power the electrical gadgets that cannot be powered by any other means. My advice to all you poor alternative lifestylers is to start off small with your energy system and keep your eyes and ears open for the most economical way out.

If you start with a small Pelton Wheel **(Earth Garden 43)**, solar electric panel and/or wind generators **(EG 39 & 41)**, then you can at least start using a radio and sound system for long periods of time without having to buy throwaway batteries. the two most expensive forms of obtaining electrical power would have to be 'throwaway' torch batteries and petrol-driven generators. If you can avoid either of those, then every dollar you save could go towards improving your self-reliant energy set-up.

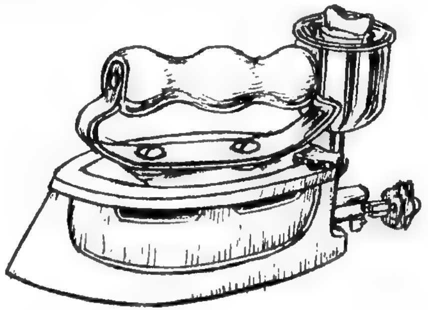
If you have enough water, in both quantity and pressure, or if you have a good windy location near your make do with kerosene lamps until you can improve your power generation system. Kerosene lamps are not so expensive on fuel costs.

If you have enough water, in both quantity and pressure, or if you have a good windy location near your home, adding a Pelton Wheel (water turbine) or bicycle wheel wind generator should be the first options you explore. Solar cells are slowly coming down in price, but they are still fairly pricy. The advantage of solar generated electricity is its reliability — wind is most unreliable — and it is worthwhile if it means lower lighting bills.

It is not really worthwhile trying to assemble your own solar electric panels. It is no cheaper and the finished product is likely to be inferior. The silicon-based photovoltaic crystals are the product of a high tech industry and they are very fragile things to handle. I suggest you save the bother and buy the finished modules, complete with waterproofing.

The charging system (or systems) is the most important link in a 12 volt or other low voltage power supply system. It's easy enough to find more gadgets to use up the power, but to keep the system going for very long, you must have at least the equivalent coming back in. No matter how big your battery is, your system is not viable if you can't get back what you use up. So you must either use less, or produce more.

You could, for example, use a mobile type, deep cycle battery such as the **Besco** Amp Power battery and charge it alongside your car battery when you go for a drive. The proper home lighting batteries should not be moved.



Shellite-type iron. Around $70 from Self Sufficiency Supplies, Kempsey, NSW.

Ironing

As far as 12 volt electric clothes irons go, I would suggest you forget that notion completely. Turning electricity into heat is not very efficient at the best of times. What you are doing, virtually, is creating a short-circuit to make the wire hot. If I had that quantity of power to burn, I would consider I had power to waste. With the old 32 volt systems we did see 32 volt irons, which would have had to rely on diesel generators (or wind generators) to keep up that sort of supply.

I think you would be better off if you could lay your hands on a **Shellite** powered iron. These have a little fuel container at the back which produces a small flame inside the body of the iron and keeps it hot. Another alternative is to use one of those old cast-iron flat irons and have it resting directly on top of a flame on a gas stove whenever you put it down.

Refrigerators

Finally on the question of fridges, you can get quite good 12 volt fridges now. I am not talking about the old LP gas-electric or three-way fridges used in caravans — they are not at all efficient. I think the fridges worth looking into are the new 12 volt compressor motor type fridges which use about 4 amps when they are running, but with the fridge closed most of the time and the thermostat turning the motor on and off when required, its average electrical consumption is brought down to about 1 amp. This still means that you have to be getting 24 amp hours per day of charge on top of your other requirements (lights, radio, etc).

Well, that turned out to be quite a long reply to a brief question. I felt I needed to say all that because I have known quite a few people to complain about their batteries not keeping a charge or having a very short lifespan when it was really their energy equation — charge versus discharge — that didn't add up.

A 12 volt DC electrical system can be expensive to run if you have to buy new batteries each year. A solar-electric system which uses an inverter to change DC to AC to run all these types of household appliances can come to many thousands of dollars. If you have lots of running water, as we do here on Blue Knob, then your costs will be considerably less.

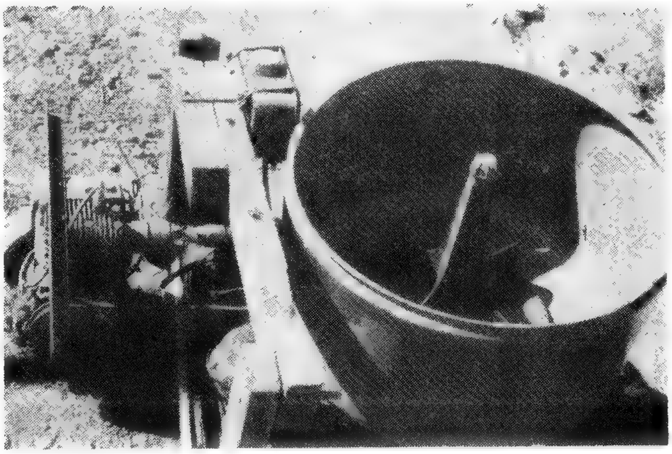
Washing machines

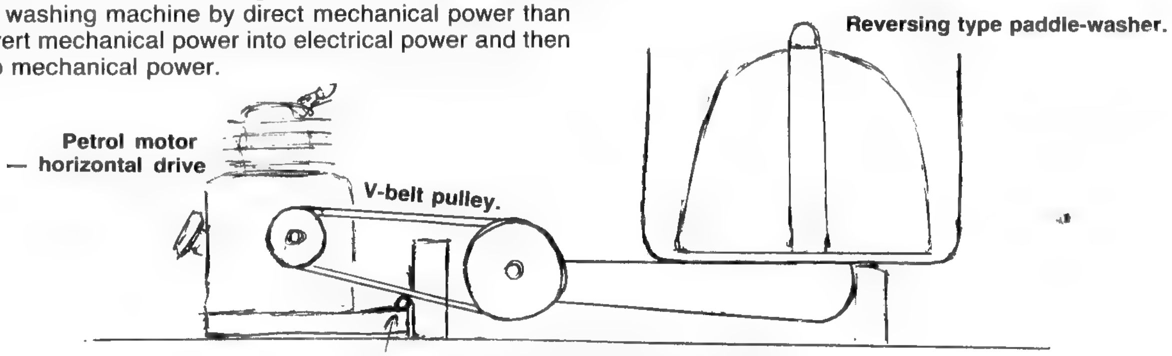
Having discussed all that, I will come a little closer now to answering the question. Yes, it is possible to drive a washing machine direct from 12 volt power. In this **Land of Topsy-Turvy** (around Nimbin), we use the washing machine motor as a generator on a Pelton Wheel to charge the batteries and then use a car generator as a motor for the washing machine!

A 12 volt car generator would have to be rebuilt to make it into a suitable 12 volt motor, but a 6 volt generator (like they had on the old Volkswagen) might be suitable as a 12 volt motor without doing very much to it. Otherwise a 12 volt generator (not an alternator) might make a suitable 24 volt motor.

Another alternative is to have a little petrol motor drive an old washing machine directly with a V-belt pulley connecting the two. You should be able to pick up an old washing machine without a motor from the rubbish tip. If you could then acquire, new or secondhand, a small petrol motor with a horizontal drive shaft, you could just connect the two up as shown in the drawing. It is much more efficient to drive a washing machine by direct mechanical power than to convert mechanical power into electrical power and then back to mechanical power.

PETROL ENGINE WASHER




Reversing type paddle-washer.
Petrol motor — horizontal drive
V-belt pulley.

Hinge allows V-belt to engage and disengage for easy motor starting.

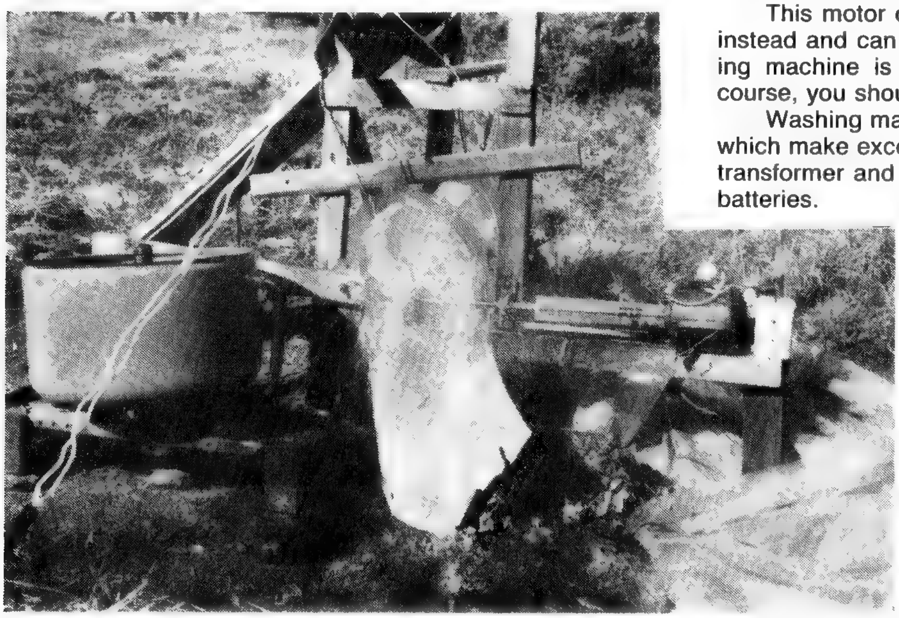
Pelton Wheel washer

On one end of the shaft driven by the Pelton wheel is a small pulley wheel onto which the V-belt is fitted when you need to run the washing machine. The belt is disconnected from this pulley wheel when the washing machine is no longer required.

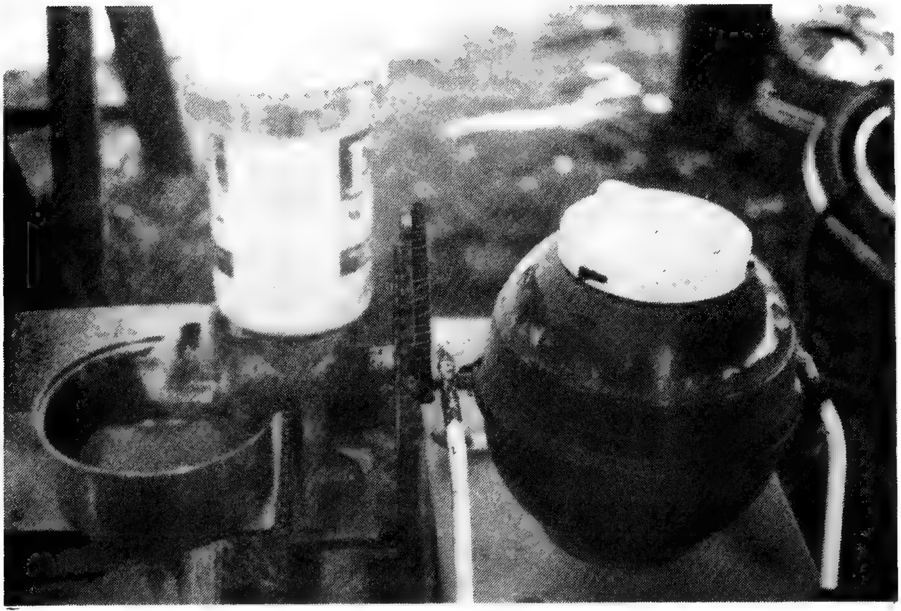
Instead of the washing machine being run via the V-belt from its usual 240 volt motor, it is driven in the same way by the water pressure instead. The washing machine motor is now connected directly to the Pelton Wheel drive shaft, but on the opposite end to the washing machine so that it doesn't get in the way of the V-belt.

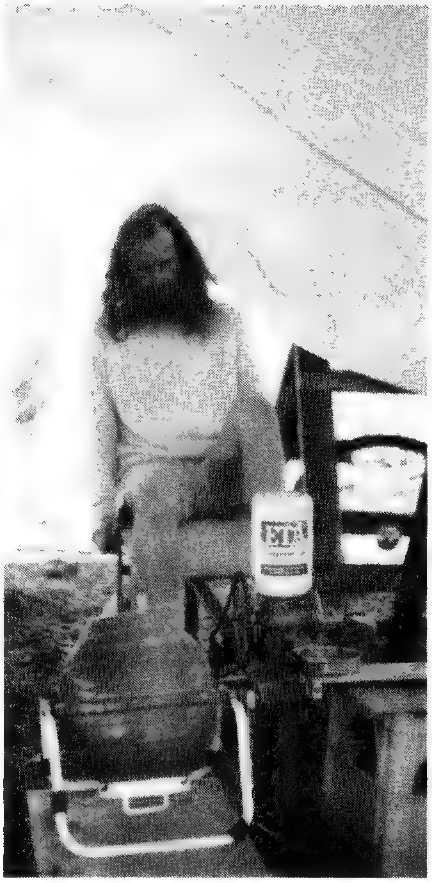
This motor can now be used as an electric generator instead and can actually charge a battery while the washing machine is running. To improve on the charge, of course, you should disconnect the washing machine.

Washing machine motors are usually induction motors which make excellent AC generators, which then require a transformer and a full wave bridge rectifier to charge your batteries.



Pelton wheel (above) drives washing machine (left).





I am using a little *Bamix* pressurised washing machine run by pedal power now as my favourite clothes washer. I actually pedal my washing machine and flour mill at the same time, as they are both attached to the same set of pedals. The grinding takes the boredom out of washing.

It only takes a couple of minutes to pedal my wash with this machine now, as it is a very efficient washing technique. I use a half hopper load of budgerigar mix grain (or canary mix) as my 'hour glass' (that should be two minute glass) to time the washing. This is because I eat birdseed porridge regularly for breakfast. It's cheap, cheap, wholesome and it fills the bill. I have it with homemade yoghurt and it's delicious, chirp, chirp!

— Peter van der Wyk

Alternative washdays

By Lindsay Corben

This is how we developed a satisfactory way to run our washing machine. We were able to find two **Lightburn** paddle and spin machines, both looking rather sad, but the combined bits and love and care produced a good unit.

There is no way, however, that a 300W inverter will start a 300W 240V induction motor. I happened to have a 240V DC motor, about 700W, so I rectified the output of the inverter to give 240V DC and that worked. Although the extra steps involve losses, you gain by the superior torque capability of the DC motor for a given current.

The DC motor was large, so we raised the whole washing machine 250mm on a timber frame. This gave room underneath for the motor and my wife likes the higher working level. The AC motor was left in position and used as a lay shaft, as its shaft has pulleys and clutch, etc. fortunately there was room for an extra pulley on the shaft for the V-belt drive from the DC motor. The AC motor cooling fan was taken out to reduce friction losses.

One interesting discovery was that the DC motor had more starting torque if there was a short time delay between switching on the field circuit and the armature circuit. In fact if both were switched together, the motor was struggling to get underway at all. I therefore included an extra switch in the starting circuit.

This arrangement did wash and — just — spin the clothes. But the duty on the inverter was rather severe, on wash about 30 amps, on spin about 50 amps (battery current) and the power transistors got pretty hot.

Recently we have changed the system to use a 12V DC motor. Now 12V motors of about 300 watts are not easy to find. The DC car generator will act as a motor, but with low speed and poor efficiency. A local whizz has worked out how to convert the generator into a good motor by enlarging the air gap by 0.5mm and rewinding the armature with larger conductors.

For the technically minded reader, the armature resistance is reduced to one quarter of the normal value by using 1.5mm diameter wire instead of 1.2mm and by using one coil per slot instead of two, each coil being connected to two adjacent commutator segments. This gives an efficient shunt motor with a no-load speed around 1400 revolutions per minute. Local people are more into research and development than production, so I consider myself lucky to have purchased one of the very few converted motors in this way.

The 12V motor system is much better. Wash current about 17 amps instead of 30 amps and spin about 35 amps instead of 50 amps and, much better spin performance. But it takes some effort to get things right. At 12V every scrap of loss counts and you really need to pay attention to detail.

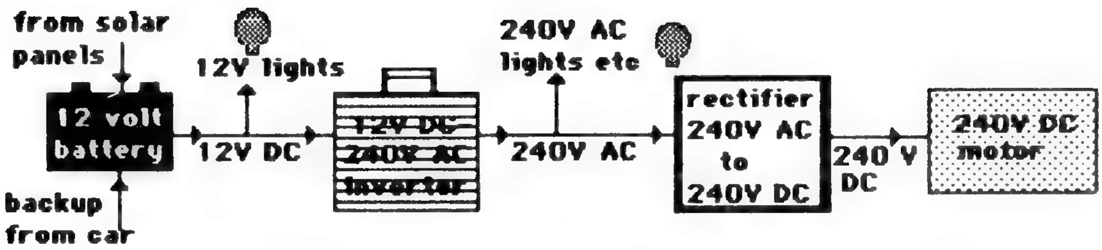


Fig 1. Block diagram shows first method of running washer on 240V DC motor.

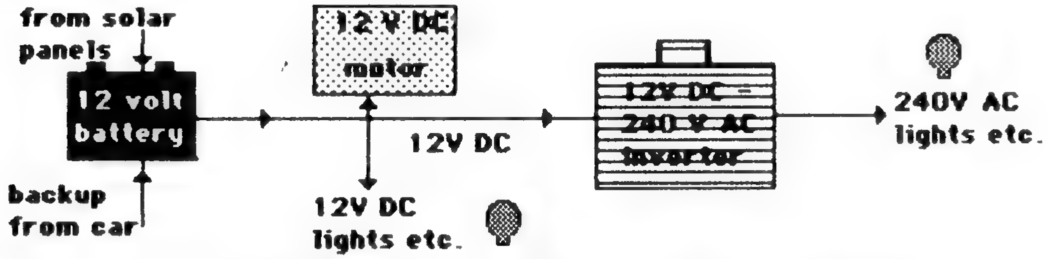
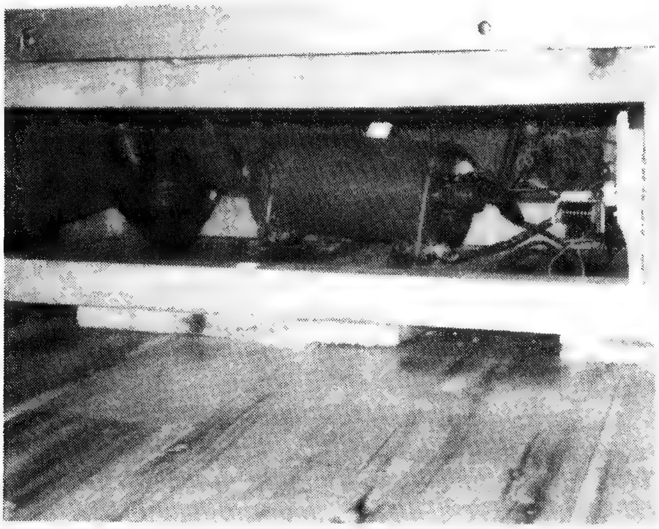
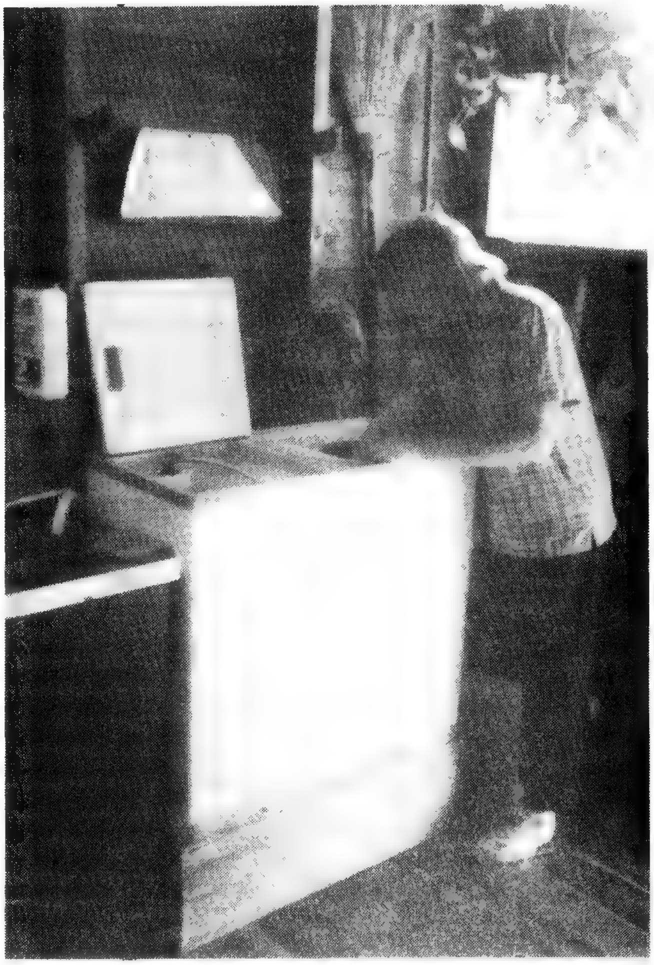


Fig 2. With 12V DC driving washing machine engine, rectifier is not needed.

The run from the batteries to the laundry, with its own 45A fuse, is only a few metres, so I used scrap copper bar about 6mm^2 cross section, doubled (yes, doubled) for both positive and negative conductors, insulating the positive where necessary with 12mm black poly pipe. To switch the heavy currents I found an automotive relay which draws only 0.6 amps and can control 100 amps, but it was costly at $30. Starter motor solenoids are suspect for this job as their coils draw quite heavy currents and are short time rated.



Motor and relay housed in base of washer.



Lisa using the modified washing machine.

Pedal spin drier

By Peter van der Wyk

A friend had given me a **Hills** exercise bike that he hadn't been using. He figured that I would put it to better use than anyone else he knew. As far as exercise bikes go, it was a relatively cheap model with nothing fancy about it. I think that any brand of exercise bike could be modified to suit a clothes spin drier.

I had found a **Wilkins Servis** (Super 16) washing machine, with a spin drier built into it, on the local garbage tip. When I dismantled the washing machine into all its component parts the spin drier had its own cylindrical cabinet that fitted inside the overall washing machine cabinet.

I took the spin drier out of the washing machine by unbolting the cross member at the base onto which the spin drier was bolted. The outside cabinet was not required in the design I had in mind. It would only get in the way, whereas that lower cross member gave me some kind of base to which the exercise bike could be connected.

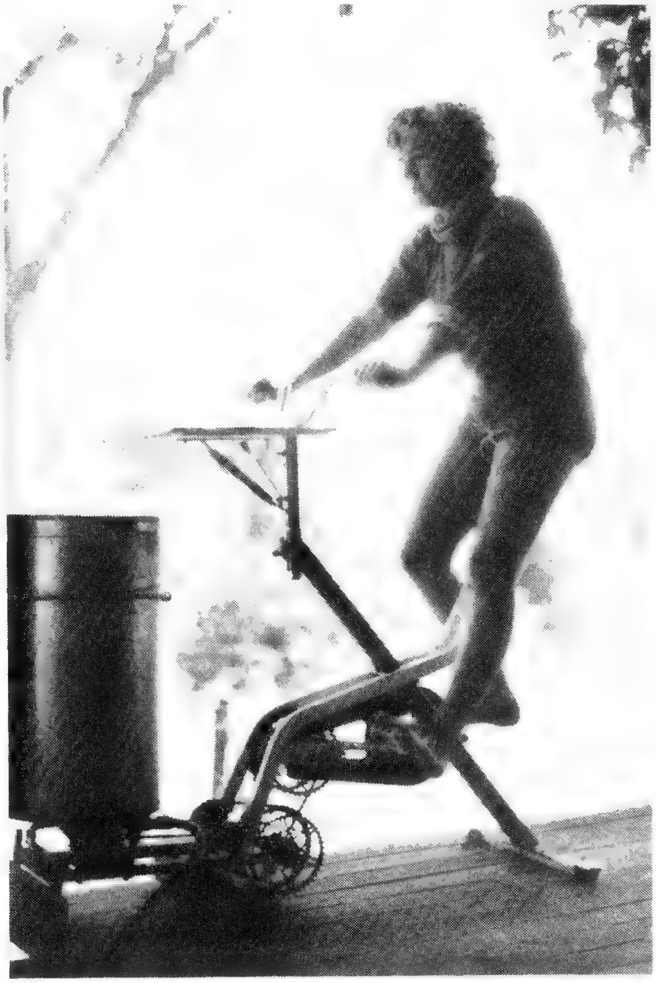
I bolted the spin drier onto the lower frame of the exercise bike using two pieces of 1 inch x ⅛ inch (2.5cm x 0.31cm) angle iron which was allowed to protrude inside the frame by about 6ins (15cm). I cut away 7ins (17.5cm) of one of the flat faces of the angle iron so that the other flat face could be bolted onto the inside face of one of the uprights below the wheel. The spin drier could then be bolted onto the other face of the angle iron which is kept to the top so that the lower cross member of the spin drier can be bolted onto it. But we won't fix the spin drier on yet.

The end of the angle iron with one flat face removed (thus a flat section) now has a ⅜in (0.94cm) slot cut into the end of it to take a bicycle wheel hub. I have found that a **Shimano** coaster brake hub for a 20-spoke wheel has every second spoke hole at the same distance apart as the bolt holes on the chain rings that were a standard fixture on most Australian bicycles 20 or more years ago. Just like treadle sewing machines, these old bicycle parts can be found all over the countryside.

These old chain rings were bolted onto the pedal arms of the crankset with five little square-headed bolts. By drilling every second spoke hole a bit larger so that these little square-headed bolts fit through you can then bolt the two together. It may be advisable to bolt this chain ring on the same side of the hub as the sprocket that normally fits on the hub.

I made up two of these brake hubs with the large (46 or 48 tooth) chain ring and a 12 tooth sprocket fitted on where the sprocket goes normally. One of these hubs fitted where the wheel usually goes on this particular exercise bike, so you don't need the wheel for this project.

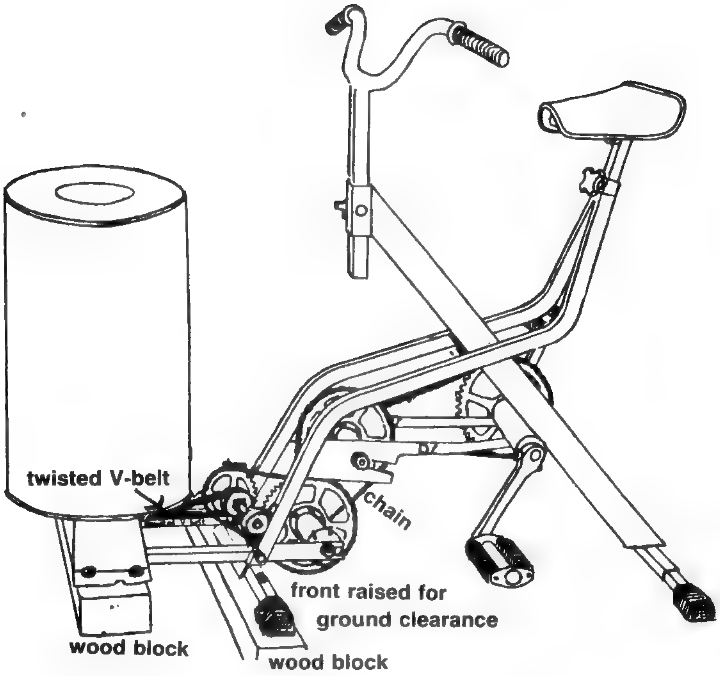
The chain from the pedals to the 12 tooth sprocket may now be fitted. Some links may need to be removed from (or added to) the chain to make it fit. Spacer washers may need to be fitted onto the axle of the brake hub to ensure that the chain runs straight (without bends) from one sprocket or cog to the other. The final tension of the chain can be adjusted by moving the hub backwards or forwards inside the slots before tightening the hub nuts (I can't say wheel nuts in this instance). The arm of the brake hub can be strapped on somewhere.



Birgit Grohmann, from Germany, tries out Peter Pedals' pedal spin drier while on a visit to Nimbin.

The second brake hub fits into the slots in the ends of those right angle brackets that we were working with before. Again you may need spacer washers, etc, to align the chain from the large chain ring on the previous hub to the 12 tooth sprocket on this one.

On the front face of the uprights onto which the angle iron is bolted and immediately above the angle iron, bolt two ⅝ inch (1.5cm) self aligning bearings through which goes a ⅝ inch bright mild steel shaft. Onto this shaft, fit the smallest cotter pin chain ring crank that you can find. The place where the cotter pin fits must be intact but the rest of the pedal arm should be sawn off. Slide the chain ring back and forth a little to line it up with the previous large chain ring. Once you've found the correct position, you should file a flat onto the shaft for the cotter pin.



At this point we need to do a small calculation. If you look at each chain you will see that it connects a larger sprocket to a smaller sprocket. Write down in one column the number of teeth on the sprocket nearest the pedals and in a second column the sprocket furtherest from the pedals on each chain. Now multiply together all the numbers in the first column (three number so far) and write it at the bottom of the column and do the same for the second column.

If you now divide the first result by the second result, you have calculated the ratio between the pedals and the shaft. This figure gives us the number of times that the ⅝ inch shaft turns for every one turn of the pedals.

The optimum ratio between pedals and spin drier is around 30:1. If you divide the optimum of 30 by the figure we have just calculated and multiply the answer by the size of the pulley that will be fitted onto the spin drier, you will have the size of the pulley needed to drive it.

For example our two columns of figures looked like this:

46	12
46	12
46	28
97336	4032

97336 divided by 4032 = 24.14087301

Now, if we put a 1.25 inch (3.11cm) M-section pulley on the spin drier, we can calculate the size of the pulley needed to drive the spin drier:

30 divided by 24.14087301 = 1.242705679.

Multiply this by the size of the pulley on the spin dryer (1.25) and we have the size of the pulley needed to drive the spin drier. So what is needed in this example is a 1.5 inch (3.75cm) pulley. I would recommend 'M' section V-belts and pulleys.

You will now, need to measure the distance in inches between your two pulleys, double this figure and place an M in front of it and that is the size of the belt that you will need (or possibly one size larger).

You may need to prop up both front legs of the exercise bike and the spin drier unit to give ground clearance for those extra chain rings. You also need to check whether all the chains are at the right tension. The larger chain needs to be able to move up and down by about ½ inch (1.25cm) and the shorter chains about ¼ inch (0.62cm).

You may also need to get hold of an elastic strap (like a luggage strap) to secure the top of the spin drier against a wall or a post so that when the washing load isn't balanced it doesn't shake too violently (it acts like a shock absorber).

SUBSCRIBERS ARE SUSTAINERS!

This is your reminder to subscribe to *Earth Garden* in 1985.

The price is $10.00 for payments received by December 31, 1984.

After January 1, 1985, a subscription will cost $11.00.

So please sustain us, and save a dollar as well! Fill out the order form on page 58.

Mudbrick methods

By David MacMunn

Our quest for a new — bigger — house has been going on for some time now and includes a fair commitment to mudbricks. The split level pole construction incorporates a 10ft high dividing wall between the two levels and three infill sections along the rear wall of the building. Then there is the extension, 5ft x 12ft, which is all mudbrick walls — we couldn't fit in our double bed, could we? So there is a liberal sprinkling of mudbricks.

Before I go on with my story, which basically is one of a gradually refining mudbrick making process, I should say one thing. You can look at all the books you like and talk to all and sundry, but it's really a matter of getting in, getting muddy and finding what works for you.

Our method worked for us in our situation. Yours may be different. Obviously, some ideas can be universally applied, but as for copying, forget it. We were somewhat influenced by two things: firstly, what equipment we had available and, secondly, the illusion that we didn't have that many bricks to make (really). Total number by the way will be about 1600. This worked for us, but it's not the only way.

When we started mudbrick making we already had the roof up, so we had a big area for drying freshly made bricks. Unfortunately the ground was sloping, so we first had to set up flat areas where we could make the mudbricks. Luckily I had a couple of swimming pool liners and some metal shelving trays and these were used as the basis for our brick-making platforms.

We used an old bathtub to mix up the mudbrick 'formula'. This scientific recipe was derived from the set of test mudbricks I made before commencing production in earnest. I had simply used the straight clay mix from the cut made at the rear of the house. After two days of drying I ended up with four mini-bricks instead of one standard-sized one. So I added more bedding straw and a bit of sand. The result was better — at least they stayed together.

I read about various tests that could be applied to the bricks but ended up doing none of them. I figured that, as our mudbricks were not load-bearing, if they held up through drying, stacking, and laying they would be okay. We had some loamy soil from a bathroom excavation and some clay from a drain dug at the rear of the house.

FIRST MIX FORMULA
8 spades of loam
8 spades of clay
double handful of sand
clutch of straw
water

This was our initial mixture. We defined a 'clutch' of straw as the amount which could be easily held in one hand.

We used shovels to turn over this mix in the bathtub and to chop it through, a part of the process which rated pretty low in the enjoyment stakes. It generally took about 40 minutes, made about eight mudbricks and resulted in most of our shovels being left as geriatrics with suspect handles (from levering the mix using the side of the bath). The appropriate amount of water was soon arrived at by experiment too.

Because of the slope it was thought easiest at first to walk to the mould with each shovelful. One person moulded the bricks and the other transported the mix, then we combined to do the mixing. Our single brick mould, made of wood with a tinplate lining, was lent to us by a friend and has managed to stay together throughout our efforts.

Every two or three bricks, sometimes more, the mould had to be washed in a big bucket kept near the brick

Mixing: Dave MacMunn mixes up the mud formula in the bathtub.

Drying: Mudbricks left to dry on flat platform where they were made.

moulder. At the end of each bathful of mud, the mould was washed more efficiently in a wheelbarrow of water. By this process we usually made 40-50 mudbricks at a time, limited mainly by the amount of flat space available. At this stage we moulded the bricks directly on our flat surfaces, so when we came to put the bricks on edge after about a week we had to get a spade underneath and lever up each brick. This was messy and it sometimes cut the bricks about because a fair thrust was required to loosen each brick.

We refined this method somewhat, adding more drying area by laying down some old doors and using the wheelbarrow to move the mud from bath to moulder. We also started using plastic sheeting on top of the flat surfaces and this meant that the bricks peeled away easily when placed on edge. It reminded me of Kraft individually wrapped slices of cheese!

Time passed and mudbrick no. 400 rattled off the production line. Meanwhile the front door was on, so our centre of operations moved and the verandah became our new moulding and drying area. A friend mentioned that stomping the mud mix with gumboots on was the only way to fly, so I gave it a go. It was like being on an aerobic treadmill in a glue bath, but it was an improvement. We could mix more in the bath, which speeded up the operation and mixing also climbed slightly on the enjoyment ratings.

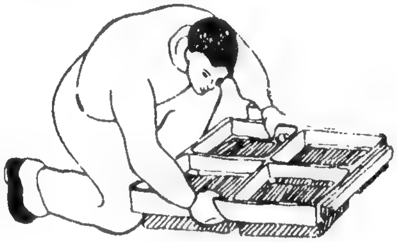
However, we had the new problem of suction on those gumboots. It's an agonising feeling to be completely stuck in the mud. A couple of times I just had nowhere to go, with both boots stuck and off balance as well, so I simply fell out of the bath. It reminded me of a cyclist I had seen in Melbourne riding up to some traffic lights and not undoing his toeclips quickly enough.

So the boots went and I stomped around in the mixture in bare feet. It was superior, but by the end of each day my feet were quite tender. (I also discovered that if I sprinkled sawdust over my mud-encrusted feet and ankles it amused the kids because it made them look really ghoulish!) we added two shovels for support while stomping, which helped. Rubber gloves were tried for moulding, but were not considered to be a great improvement and they tended to start slipping off in the mud.

Maturing: After a week, mudbricks are stacked on edge to dry out.

One improvement we have just made after advice is that when mud is piled into the mould it is left as a tall pile and a couple of handfuls of water are added to the top. This drains down and lubricates the brick against the mould so the mould releases more easily. Our method of late has simply been to wash around the mould with well-watered hands.

So there you are at our present state of play. We could easily refine our mudbrick making further given a rotary hoe or tractor to puddle and more flat areas on which to mould the bricks. A multiple mould would also be an improvement but our method works for us and besides there aren't that many more bricks to go — really.



EARTH TO WATER

By Colin Ashby

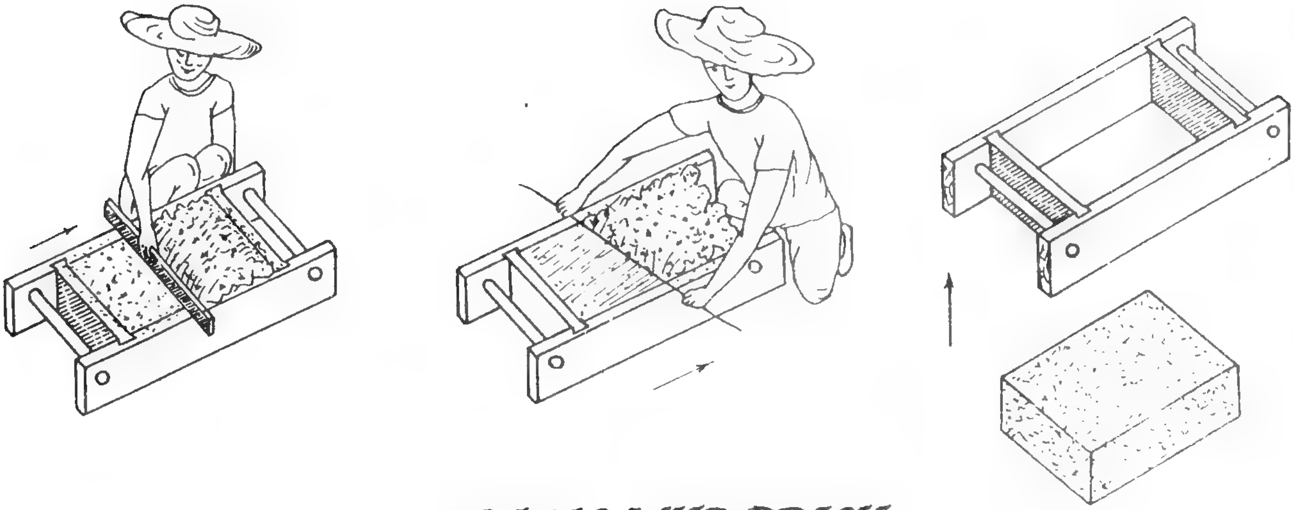
Most books seem to suggest adding water to the earth when mixing mud for mudbricks. I have found that it is far quicker to add the earth (or mud) to the water. This can be done very simply by forming the earth below the heap to make a dam, filling it with water, and then adding earth until the correct consistency is obtained.

The only mixing then required is a few turns of the shovel to bring the outer edges of the dam to the centre. This saves a lot of mixing and also means that you can make your mud wherever the earth happens to be, rather than barrowing it to some container to be mixed.

The second point I would like to make concerns the drying and stacking of the bricks. As I live in a high rainfall area, rain has been the biggest problem. I found that the most vulnerable time for mudbricks is when they have been stood up on edge 'for further drying before stacking'. If it rains heavily during this period (and it always has), plastic coverings can belly and cause the bricks to fall over, often sheeting water on them, resulting in lost bricks.

I overcome this problem simply by leaving the bricks lying down until they were dry enough to handle and stack immediately ready to lay in place (usually after about a week of dry weather). This means that you only need to handle the bricks once before laying. If you make all the bricks before starting to build your walls, there should be enough time for them to dry, even double-stacked in two rows.

Using these methods I found that I could easily make 100 mudbricks in the morning over about 3½-4 hours and then spend a leisurely afternoon stacking bricks. I fail to see how a mixing machine such as the one suggested by Rob Thomson **(Mass mud mixing, Earth Garden 43)** could achieve better than this, since you still have to shovel the earth into the machine and then shovel it out to make the bricks.



BASIC MUD BRICK

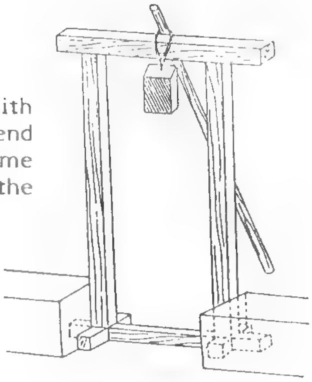
Basic Mud Brick

Lin Wei-hao

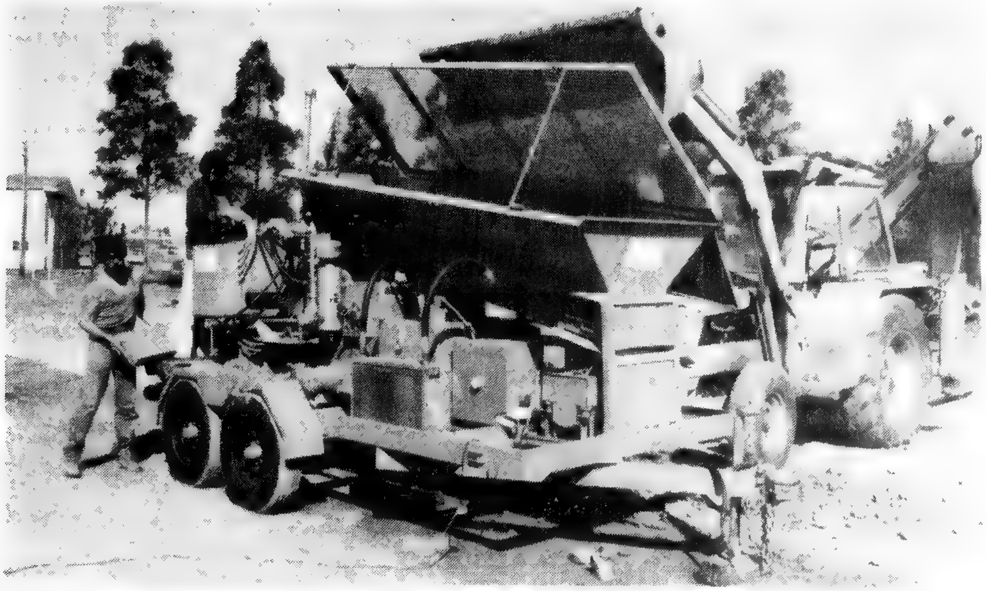
Edited by Ron Edwards, The Rams Skull Press, Kuranda, 1984, paperback, 20 pages, illustrated by the author. Price $3.00, plus 45c postage, from The Rams Skull Press, Box 274, Kuranda, Qld, 4872.

A sound introduction to mudbrick building the way it is done in China, explained in a brief text and many drawings by Lin Wei-hao, who lives in Kunming, where he is employed by the Yunnan Institute of Architectural Science. It starts with illustrations explaining how to make and assemble mudbick moulds and covers rock rubble foundations, posts in walls, mixing, making and laying mudbricks, door frames and windows and how to build a wooden handcart for use on the building site.

Lin Wei-hao is the co-author, with Ron Edwards of the book, ***Mud Brick and Earth Building the Chinese Way*** *and wrote* ***Build a Chinese pigsty*** *for us in* ***Earth Garden 42.***



A leaning timber with a weight on the end holds the door frame in place while the wall is being built.



This is the mighty earth brick machine, as seen on ABC TV's *Towards 2000* programme! It will make about 600 strong compressed earth bricks measuring 350 x 250 x 85mm per hour, or 5000 bricks per day on site — enough for the walls of a 15 square home.

● Send SAE for information to:

***Terra Firma Blocks Pty Ltd*, PO Box 195, Eastwood, NSW, 2122.**

House doctor

BUILDING ADVICE

Bob Rich, our regular contributor on earth building is a former research scientist at the CSIRO. He has built his home of earth at Moora Moora Co-operative in Victoria and holds one day building courses ($25 per day) there in the summer months and you may consult him on specific building problems which he will answer (like the one here) at $10 per hour. Send SAE for details to Dr R. Rich, PO Box 214, Healesville, Victoria, 3777.

Dear Dr Rich,

I have read how you make your mudbricks in *Earth Garden* under the title *Bob's Bonza Brickmaker.* We live in a tropical weather area and have been advised to use cement in our bricks. Using your method, how would you advise when to put in the cement.

Thank you and hoping to hear from you soon, Mrs K.W.

By Dr Robert Rich

Dear Mrs W.,

Thank you for your letter.

In answer, first, I would like you to note that I charge a small amount for advice through the mail, at the rate of $10 per hour of my time (current professional consulting rates are $34 per hour).

Second, brief as your note is, it shows there are several ways that I can be of use to you. Whether you should build in earth at all depends on the microclimate of your particular location. If you build with earth, the technique you should use (including the need for cement) depends on the soil available more than any other consideration. The person who advised you to use cement because you are in a tropical area can't be very knowledgeable about building with earth.

Finally, you should (and I hope you do) know some things about house design appropriate to internal temperature control, protection for the walls from the weather and protection from cyclones.

(a) *Using earth* I consider earth and other massive materials unsuitable in the coastal tropical regions. The heavy walls pick up the heat and are unable to cool down unless night temperatures are considerably lower than in the daytime. If your location is fairly high you should have enough temperature swing over a short time (two or three days at the most) to make a heavyweight wall suitable.

(b) Assuming that this is the case, you would use mudbricks if your subsoil is fairly clayey. If the soil is sandy you should make the walls of rammed earth (pise). There are good descriptions of both techniques in a number of sources, for example the Experimental Building Station's *Bulletin No 5,* G. F. Middleton's *Build Your House of Earth,* Alistair Knox's *Living in the Environment* and a great many back copies of *Earth Garden* (eg, Pioneer Pise in Earth Garden 16 and Mudburra in EG24. They are selling back copies 1 to 36 at $50.00 — a bargain and a real storehouse of information.).

(c) *Cement* works by coating each soil particle. Clay particles are very small, so you need an awful lot of cement to make any difference, and you have to make the mix very wet in order to get a good mixture. Since excess water weakens cement, in the process of getting it in you are destroying its effectiveness.

Here is a test. Half fill a bucket with a very wet mix of water and your soil. If the water rises to the surface in half an hour or so, the soil can be cement stabilised. It may still be okay for mudbricks (try it out), but it will probably be more suitable for ramming, or for making compressed blocks.

If the soil holds the water there is no point in adding cement, or in attempting to compress it. It will make good mudbricks, though you will need to experiment to find the most suitable method. My *bonza brickmaker* (EG29) reduces the work to about half if your soil is heavy clay and to about a quarter if it has 30%-50% sand.

With heavy clay, I wouldn't make the mix as wet as my article describes. I'd mix up the right quantity of mud on a flat surface, pile it up, then put boards around it to make a multiple frame and finally divide it up with wooden dividers. There is little point in adding cement at all. However, with any kind of hand mixing, cement should be well mixed into the dry soil before water is added.

You could also read my article in *Earth Garden 32* on using formwork *cob* construction instead of mudbricks. This technique is very much less labour intensive than any form of mudbricks, uses the same kind of soil and can be made to look exactly the same. The only change I would make to that article is: the heavier the clay, the less water you should use in your mud (because of the drying time).

(d) The house should be designed to keep you cool in hot weather and warm during those cold, frosty nights (as I noted, if the nights aren't cold you should build a lightweight, well-insulated house). Shading, orientation (minimum wall and window area to the west), cross ventilation, high ceilings with an openable vent at the top, cooling the roof by trickling water down it, covering the house in creepers — these are the kind of things you can do.

Protecting the walls from the weather is achieved by the following:

1. Make them well. Properly made earth walls stand up to an incredible amount of driving rain.
2. Make sure ground water can't get at the walls. I recommend a minimum of 300mm of masonry (brick, stone or concrete) footing wall under earth walls; higher if there is any danger of floods. There should be a dampcourse on top of this.
3. You want an overhang to keep out the sun anyway. Wide verandahs and eaves protect the wall from the weather as well.
4. A good, sound render on the outside will protect your walls from anything the climate can throw at you.

An earth house can be made cyclone proof:

1. Heavy reinforced concrete footings.
2. Steel rods set into this (with bottom ends bent over to anchor them), extending up inside the walls and tied solidly to the top plates.
3. A reinforced concrete lintel above door height should tie the whole house together. Earth walls can continue above this if wanted.
4. The roof should be solidly bolted to the top plates.
5. A truss roof has the geatest inherent strength.

I hope this information will go a long way towards allowing you to make informed decisions about your building project. I spent about two hours getting this information together and writing the letter, so a cheque for $20 will be appreciated.

Good luck and enjoy building. — Bob Rich.

A sheepskin rug

By Barbara Greaves

I tan sheepskins to use as floor mats and car seat covers. They also make great mattress covers, but it's hard to get out of bed on cold winter mornings!

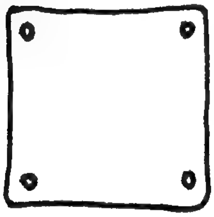
Unless the tanned skin is for a floor mat, I wash it after tanning to get rid of the kero smell.

It's easy to make a sheepskin bed rug from scraps of skin, joining the pieces together with crochet work as illustrated. I bought a jumper from an Op-shop and unpicked it for the crochet. I'll make a cover for the rug to save washing it.

Using this method you can also make slippers, cushion covers, hats and seat and mattress covers from skin scraps.

See **Tanning sheepskins** (Earth Garden 25 and Essential Earth Garden) and **Tanning at Home,** by David & Meg Miller (Earth Garden 4).

1



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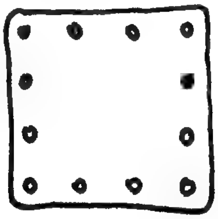

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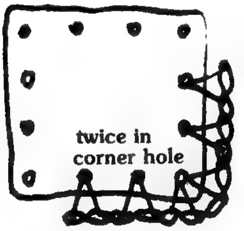
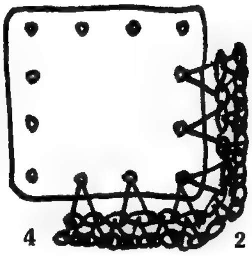


1 double crochet
2 chain all round

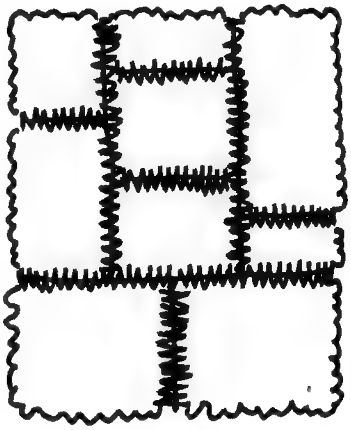
4



JOINING SHEEPSKIN PIECES

1. **With the skin side facing you, make holes with a leather punch. Do corners first.**
2. **Then make holes approx 1cm apart all around the piece.**
3. **Crochet.**
4. **Next row double crochet all round. Fasten off.**
5. **Sew pieces together to make your bed rug.**

5



Woolly Jumpers

A useful coat for newborn lambs in cold but dry weather can be made from the sleeve of an old woollen jumper. You simply cut it off to the desired length and cut four holes for legs in appropriate places (five for ram lambs). If it is a wide sleeve and a small lamb, you may need to run in the seam a bit first. The cuff of the sleeve makes a nice snug crew neck on the lamb's jumper.

I keep the lamb-coats on for the first few days. They resist light showers but, of course, if it rains heavily you should take them off.

Jill Whitford, Avonleigh, Victoria.

Herbs from the garden

Barry Philp & Lesley Jacobs, Department of Agriculture, SA Bulletin No 24/77, 1983 (revised edition), large format booklet, 19 pages, illustrated. Price $2.00, plus 40c postage from GPO Box 1671, Adelaide, SA 5001.

"Adelaide is fortunate in having an almost ideal climate for many herbs. Most herbs are native to the Mediterranean and southern Europe regions, which have similar climates to South Australia."

This introduction is basic but well done — and worth the price! Barry Philp is a horticultural adviser and Lesley Jacobs home economist at the Department of Agriculture, SA, ensuring a good mixture of advice for herb growers and eaters.

The methods of Jean Pain

A new edition of Jean Pain's book on brushwood composting (received in *Earth Garden 42) is now in print. Price is $12.00, including postage from Antenna of Comite Jean Pain,* 60 Worongary Road, Mudgeeraba, Qld, 4213.

PLEASE READ THIS CAREFULLY

Land lines is a free service, restricted to current Earth Garden subscribers who wish to buy, sell, lease, caretake or seek land. It is not a lonely hearts column.

Subscribers must include their name, surname and full address as proof of sincerity. They are responsible for checking all deals thoroughly. Please keep listings to 50 words, plus the address.

For sale, between Gympie and Maryborough, Queensland, 42 acres, quiet and secluded, mostly cleared, some timbered, good access road, power and phone available on property, State Forest adjacent, permanent creek runs through. Small caravan and annexe, centrifugal pump and polypipe, Kombi in working order for farm vehicle. Price $35,000.

Barry Prout and Kathy Haviland, 72 Tennessee Ave, Tarragindi (Brisbane), Qld, 4121. Phone: (07) 892 3212.

For sale: 19 acres tropical rainforest midway between Mossman and Daintree in far north Queensland. Permanent creek and borders on National Park. New, all-weather access road five minutes to country schools, boat and ramp, or 15 minutes to Mossman. This area was selectively logged 40 years ago, but remains dense tropical jungle abounding with wildlife. Price $60,000.

Reply to Bev or John Marris. Phone: (070) 98 1704, or write PO Box 388, Mossman, 4873,Qld.

land lines

One-fifteenth share in 300 acre community farm in beautiful valley in the foothills of the Great Dividing Range, 25 miles from Warwick, 85 miles from Brisbane. Fertile soil, permanent creek. Opportunities for agricultural endeavours, alone or with other members. Cabin 45ft x 35ft faces north with fine view on own hectare homesite. Newly overhauled 32 volt lighting plant with washing machine, vacuum cleaner, iron, Mixmaster and blender. Wood stove, large kero fridge, new 3000gal rainwater tank. Fenced vegie and herb garden, fruit trees. Telephone connected, power available, school bus passes door. Price $15,000.

E. and S. Colladetti, Maryvale (North Branch), MS 394, Warwick, Qld, 4370. Phone (076) 66 1129.

We are a middle-aged couple who love the quiet bush. We have no ties and are looking for a small acreage to buy or lease, 2-5 acres, preferably in south east Queensland-northern NSW, cheap please, or a small cottage that we can caretake for someone. We are vegetarians, do not smoke or drink and have no pets. If you can help in any way, please write. Many thanks.

Jim & Florrie Webb, C/- Watson Park, Gympie Road, Kallangur, Qld, 4503.

For sale, 102 acres of bush land, two titles, freehold, at Ballandean, southeast Queensland, on the Severn River in secluded area. Land mostly very rugged, with approx 20-30 acres suitable for orchard or vegie cultivation. Small stone dwelling commenced. However, our circumstances changed and we have returned to WA leaving the block undeveloped. Price $33,000 or offer.

For further info, write K. Devoy, PO Pemberton, WA, 6260.

Our house is worth $57,000 according to real estate agents, but we are selling for $53,000 ($51,000 for cash), as we want to get to the coast or Queensland soon. So if anyone wants a large old rambling home (painted throughout), with nothing to spend, on land 200ft x 60ft, in a quiet cul-de-sac a few minutes from rail and Mall shopping area), let us know (we offer $100 to anyone who can find us a buyer). Or if anyone has a home to swap, preferably old Aussie-style on a road between nowhere and somewhere, let us know.

Pat Cunningham, PO Box 97, Leura, NSW, 2781.

Art teacher, soon to retire, seeks weatherboard or brick house, liveable condition to renovate, which he can use as a base for painting expeditions NSW country. Up to $19,000.

J. Parker, 5/3 Gallimore Avenue, Balmain, NSW, 2041. Phone: (02) 810 4779 or 438 2834.

Billen Cliffs is a 321 hectare multiple occupancy in beautiful north-east NSW (near Lismore and Kyogle). Although not a commune, Billen Cliffs caters for people from all walks and age groups who desire to get away from the rat-race and ruts of urban living and join in the project of creating a rural village, with emphasis on self-sufficiency, low-cost living and community lifestyle. With over 40 families now resident and 96 units sold, there are still 18 scattered two acre building sites available, from $8000 to $12,000 with separate title and a share in common of the many acres of reafforestation and pastoral grounds.

Want to know more? Phone: (066) 33 7147, or write Don Tilbury, C/- PO Box 895, Lismore, NSW, 2480.

For sale: five-sixth share in 62 acres (tenants-in-common), 15 minutes from Kempsey, NSW. Very large two storey house, unfinished but habitable, sheds, pens, etc. Some clearing, mainly forest with excellent timber. Two dams, phone. Power and finance available. Price $55,000 or near offer.

Phone: (065) 66 8345, or write Michael Percy, Spooners Avenue, Collombatti, NSW, 2440.

In the near future I intend forming a group in Brisbane concerned with self-sufficiency. Anybody, whether living in the city or the bush, may come to monthly meetings and learn ways to survive in the era of rising unemployment.

Please write for further particulars with SAE to Vic Calthorpe, PO Box 42, Mt Nebo, Qld, 4520.

For sale. Secluded rainforest block, 128 acres, on Atherton Tableland at Topaz, near Mt Bartle Frere. High rainfall area, steep terrain, ridges sloping down to mountain creeks. Permanent springs, rapids, wonderful variety of plant and animal life. May be suitable for declaration as wildlife refuge. Quarter acre cleared, gravelled access. Electricity and phone nearby. About 15 miles from nearest town, Malanda. For immediate sale, $70,000.

Contact Colin and Carmel Digby, PS 1575, Malanda, Qld, 4885. Phone: 96 8282.

100 acres Tabulam, NSW, one-fifth cleared, three dams, two with gravity feed to orchard, gardens and comfortable cottage. Price $42,000.

Nigel Stops, Ewingar Road, Tabulam, NSW, 2470. Phone: (066) 66 3565.

Me and my Mac

Apple **Macintosh**
List price $4,195. Haggle with your local Apple dealer.

Technical: Memory: 128K (kilobytes) RAM, (random access memory), 64 K ROM (read only memory). Microprocessor: 32 bit MC 68000. Discs have 400 K possible capacity.

I've spent the last couple of months opening windows, viewing icons, digesting menus and playing with a mouse.

All part of the fun of learning how to use Earth Garden's new **Macintosh** personal computer!

The hardware package we bought consists of:

☐ a detached keyboard, just like one on an electric typewriter.

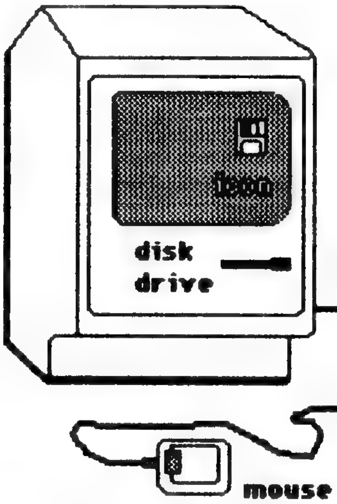
☐ a main unit like a portable television set with a video screen monitor which Apple likes to call the 'desktop'

☐ an inbuilt disk drive machine, the heart (or core!) of this Apple.

☐ the mouse is a control button on a mobile box with a cable 'tail'. Every move of the mouse on your desk or table moves a pointer or cursor on the screen desktop in exactly the same way. You click the button to send commands to your computer.

☐ a printer to capture screen images as 'hard copy' on paper.

Two software disks come as standard equipment with this package — **MacWrite**, a word processing programme and **MacPaint**, a kind of animated drawing board which has pencils, brushes and spray cans, patterns, straight lines and circles to help you to draw simply or artistically.



The Apple Macintosh main unit showing an icon on the 'desktop', representing a software disk, disk drive opening and the mouse. It weights just 7.5 kg.

You can think of hardware as the machinery or body of the computer, while software is its programmed memory or brains. Each software item is stored on a 3.5 inch thin floppy disk encased in a rigid plastic jacket.

The articles on this page were written using **MacWrite** and the drawings were done with **Mac Paint**. This story is in 9pt Geneva (type size and font) in a column 13 ems wide (the same measure we use for our land lines and letters pages).

I found the mouse simple and speedy to use, inserting letters or words, opening and closing windows containing information, drawing or changing type faces.

This page has been printed out on the Apple **Imagewriter** printer which can accurately copy any text or illustration on the **Mac** screen.This small (5 inch x 7 inch) screen can display 175,104 picture elements (pixels) in black against a light grey background with perfect clarity and absolutely no flicker.

Most of the work we do preparing **Earth Garden** is concerned with shuffling bits of information from one place to another. We choose articles from our readers and contributors and type them up, editing and changing them where necessary, marking the text and retyping before we take the final copy to the printer for typesetting. At times we may need to delete a word here or there, or cut out a few lines or a paragraph and stick them in somewhere else in the story to improve its flow and sense.

A computer with a word processing programme is the ideal tool to help us with this work. With the **Macintosh** we can do all these routine editing tasks, cutting, pasting, deleting and rearranging the words of each story on the screen and printing it out only when we are satisfied with it.

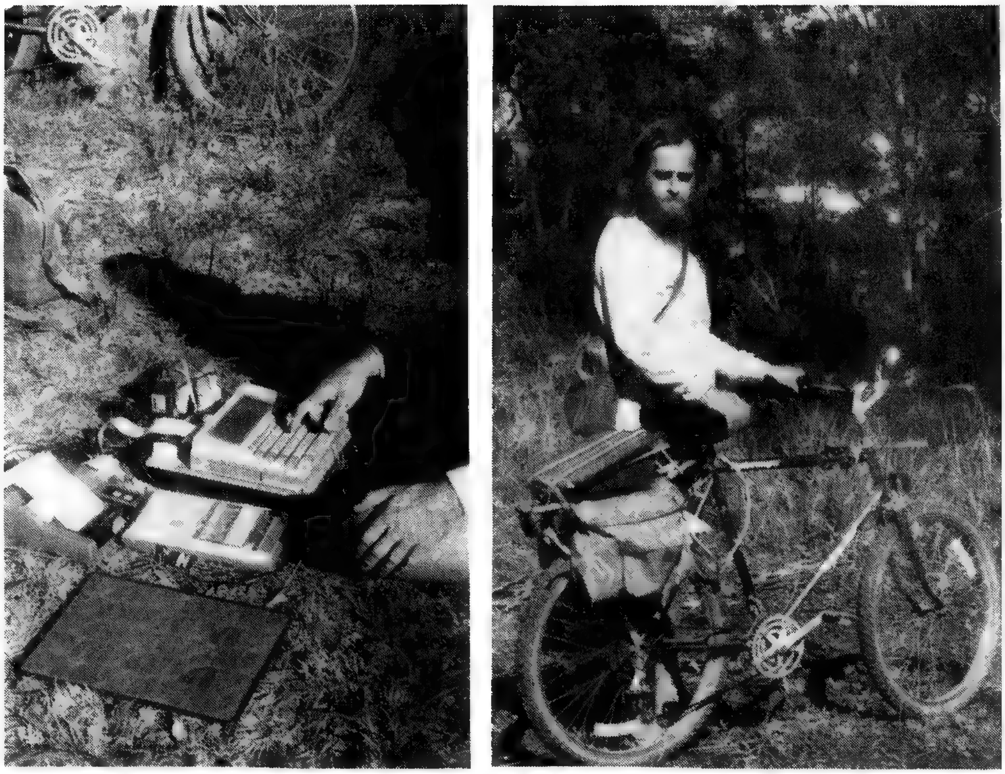
But that's not all. We can also do headings or highlight text in a range of

type FONTS, sizes and styles, such as **bold**, underlined, shadowed, or *italics*.

The **Macintosh** is the ideal computer for someone like me who has missed many advances in technology in newspapers, such as visual display units (VDUs), since leaving 'straight' journalism 12 years ago. It leapfrogs me over cumbersome coded PC's, into a world with richly creative possibilities for work and play. For me, the **Mac** is Apples!

- Keith

Peter's Portable



Left - Peter Pedals at work with solar panel, printer and tape recorder. Right - Peter with portable computer gear packed on his bush bike.

A bicycle comes clunking down the bush track. It stops and in a few minutes, Peter van der Wyk has unloaded a solar cell panel, 6 volt battery, portable computer and printer and is at work in the sunlight.

"I can carry my portable computer and its solar panel power supply on my back wherever I go by bicycle, come rain, hail or shine", says Peter.

Computers have come to the hamlets in the hills and forests around Nimbin in northern New South Wales, a focus of the alternative society, where Peter lives on a community at Blue Knob. Several members of the Australian Association of Sustainable Communities (AASC) and Rural Resettlement Task Force (RRTF) in the area have **Microbees** running from 12 volt electrical sources.

Peter is well know as an innovator and tinkerer, who designs and builds efficient low energy wind generators and other devices from bicycle parts. He earned the nickname **Peter Pedals** because of his enthusiasm for bicycles as transport and his adaptation of pedal power to "anything that moves".

He uses computers to write articles (including those for **Earth Garden**), for designing graphics for his practical alternative energy plans and for writing programmes in **Microsoft Basic**.

It's not surprising that Peter is using his new bike, a 15 speed lightweight Japanese machine marketed in Australia by **Malvern Star**, to carry around his portable solar computer kit. Sold as a Bush Ranger, the bike has balloon tyres and is ideal for rough, hilly bicycling.

The solar cell panel connected up to Peter's portable computer, via a 12 volt lead-acid gel battery, is an **Arco** M-82, 7 watt panel. It measures 28.5 cm x 36.1 cm and produces 15.9 volts at 0.46 amps in average conditions.

The computer Peter is shown using is his 'old' **NEC/PC - 8201A**. This has now been linked up with his new printer, a **Brother EP/44** portable electronic typewriter and dot matrix printer. "It has an excellent printout" Peter says, "and almost doesn't look like a dot matrix printer as it has very well formed characters."

Peter's neighbour, Brian Solomon, has connected a **Microbee** directly to 12 volts and has modified a 12 volt black & white TV set for use as a monitor, making the screen softer on the eyes by stretching orange cellophane over it.

NEC/PC-8201's like Peter's are used as 'electronic notebooks' or 'lap computers' by newspaper reporters, who send their stories by modem directly to the main computer which will finally print it out on a typesetter. Comments Peter:"I would like to see alternative publications work towards the same level of efficiency.

"Another ambition of mine is set up a Nimbin-based Bulletin Board and data base system. This would enable anyone with a computer and modem to phone the Nimbin Bulletin Board computer and either request a piece of information or deposit information into the system."

Evolution at Co Ev.

Things have been moving fast since Stewart Brand, begetter of the famous **Whole Earth Catalogs** and **CoEvolution Quarterly** magazine, picked up an advance cheque for $589,826 from U.S. publisher Doubleday to produce a **Whole Earth Software Catalog** last year.

Brand first launched **Whole Earth Software Review**, which covered computers and software from the user's viewpoint. Now, after three issues of this excellent little magazine, he has decided to merge it with **CQ**, which should mean the best of both worlds for his readers.

The new publication, **Whole Earth Review**, will come out every two months. Subscription is $U.S.18.00 per year, plus $6.00 per year surface mail to Australia, from 150 Gate Five Road, Sausalito, California 94965, U.S.A.

more land lines

For sale. Our house in the township of Darby in north-east Tasmania. Description: formerly a miner's cottage, now with additions, approx living area 8½ squares. Sits on a full ¼ acre town building block, fenced with back-offs and palings. Town water (no additives), septic tank, fenced vegie garden and hothouse, fowl run and 11 fruit-ful trees. Price $17,000 negotiable.

For further information, contact Terry & Chris Smith, C/- PO Darby, Tasmania, or phone (003) 54 2229.

Are there any Earth Garden readers, either retired people or young couples, who would be interested in a caretaker-type situation on our recently acquired 11 acres near Albury-Wodonga, a discontinued poultry farm? You would need your own caravan, electricity etc. Our main objective is to produce game birds (pheasant, quail, guinea fowl, squabs). The shedding is solid and Albury water supply is connected, soil is well drained and surroundings picturesque. There would be plenty of room for individual projects. If you are interested, please write and give as much explanation of your background as possible.

Terry & Harriet Jones, 12 Easterby Court, Howlong, NSW, 2643.

We are looking for someone to live and work with us. We are building a house and setting up a small permaculture system. There are plenty of skills to be learnt in building, organic gardening and permaculture. Both of us, Andrew, a botanist (29) and Rosie (35), a community activist, also work with the peace and conservation movements in the area. We live on a vegetarian co-op. Hard drugs are a definite no-no, no tobacco preferred. We are offering board, hard work and pleasant company in one of the most beautiful rainforest areas in the north coast of NSW.

Please write or phone Rosie Kaplan, RMB couchy Creek Road, via Chillingham, NSW, 2484. Phone (066) 79 1481 (let the phone ring at least 17 times).

Shares at Byrill Creek in the beautiful Tweed Valley (Murwillumbah 20 mins, Nimbin ½). Panoramic views of Mt Warning and surrounds, creek frontages, quality grazing land and forested slopes. Land owned by a company of which each shareholder is a director. Shareholders have sole rights to their lot; all lots surveyed. Price $15,000-$17,500, includes internal access roads and legal expenses.

Mick Cahill, C/- Uki, NSW, 2484. Phone: (066) 79 7184.

Five acres planted to fruit trees with dam at Tyalgum in the beautiful Tweed Valley near Murwillumbah, NSW. Prefer to sell a half interest for $17,000, but would consider full sale or caretaker offer. Only 2km from village on main road.

Contact Tony Douglas, 62 Lower Dandenong Road, Parkdale, Victoria, 3195. Phone: (03) 583 8770 (AH).

Quiet living reliable person or couple offered self-contained beachfront flat at nominal rent in exchange for providing evening meal daily and occasional caretaking/maintenance duties for widower with established home organic garden, 3 acre bush setting. Hobbies: honey production, conservation, wildlife. No cats, dogs, but ample room for vegie patch.

Write L. C. Masterman, C/- PO Box 9, 1a Arlington Esplanade, Clifton Beach, Qld, 4871.

We live on a cattle property on the Nymboida River, 40km out of Grafton, NSW. There is a small stockman's cottage on the property with about 5 acres of fenced land fronting the river. This would be suitable for someone, preferably a couple, who want a retreat in a superb setting. Soil is rich and water and firewood plentiful. There are a number of large established orange trees, some grapevines, a fig and a quince, plus an old shed suitable or a workshop. Our idea is to have someone living there who would be prepared to work for us for one whole day a week in lieu of rent. Work would include involvement with property management, perhaps some housework and maybe helping out in a pottery studio. We live 3km from the cottage.

Write or phone, Sandra Taylor/Lawrence Hanley, 'Blackadder Workshops', Old Glen Innes Road, Buccarumbi, via Grafton, NSW, 2460. Phone: (066) 49 4134.

Rainforest land, Atherton Tablelands, 118 acres of rainforest adjacent to major National Park near Ravenshoe, presently owned by four shareholders. We wish to contact any conservation-minded people who may be interested in any of these options: (1) Purchase of the whole block; (2) Purchase of a single title block subdivided off the main allotment (approx 15-30 acres); (3) Purchase of a share (value negotiable) in a trust designed to preserve the property in its natural state as a protected flora and fauna area.

Please contact Ms Cheryl Bean, Madrill Road, Mothar Mountain, via Gympie, Qld, 4570. Phone: (071) 83 5124.

For sale: Share in a 326 acre conservation co-operative at Kangaroo Ground, Victoria. There are 32 members in the Co-op, which was set up about 12 years ago to conserve and protect the plants and animals native to the end of Isles region of the Yarra. Shareholders each have a 3/8 acre site on which to build. Sites have access to underground electricity and telephone cables. There are rules regarding building materials, keeping pets, etc. Most members have already built and are living on the Co-op, so there is a well-established community.

A wilderness area within the Co-op helps in preserving wildlife. The remaining acres are mainly bushland. It is about an hour's drive from Melbourne. Price $7500 negotiable.

For further information, contact John or Margaret Murphy, (03) 347 6925 after 6 pm.

For sale, 55 acres of beautiful country, 16km from Kyogle. Permanent creek, school bus passes door. Timber house, good condition, suit big family, also smaller dwelling in good condition, suit grandparents, etc. Phone, electricity, Everhot stove, 5000 gallon tank, outhouses, fenced. Cattle on agistment at present. Good 5 HP pump on creek. Owners past it, unfortunately.

Contact Jim Jones, Upper Eden Creek, Kyogle, NSW, 2474. Phone (066) 33 3164.

We are a group striving for spiritual awareness and for self sufficiency. We have 70 acres and a river, 3000 feet above sea level, fruit trees and vegetables. Anyone welcome. No drugs, alcohol or pets. Camping facilities.

Write to James Beck, Walsh River Community, Box 24, Herberton, Qld, 4872.

$125,000 will buy you 1100 acres of peace and quiet, capable of carrying 200 head of cattle. Excellent water with two creeks, two dams, well with windmill. Undulating to hilly ironbark ridges in four adjoining portions. Small old three bedroom cottage, CEB power, telephone, 30 miles from Rockhampton.

Jim Schofield, Mountain View, Morinish, Qld, 4702. Phone Morinish 1D.

For sale — 2¼ acres high, frost-free land, road frontage, school bus at door, 10km from Macksville and Nambucca beaches, great view of lovely small valley, all cleared, electricity on block, possible dam site, building permission. We are your neighbours committed to conservation, re-treeing and organic farming. Price $22,000.

Wendy & Art Mylrea, "Hilland", Soldier Settlers Road, Newee Creek, via Macksville, NSW, 2447. Phone (065) 68 2093.

Shareholders wanted at Mookima — 1238 acres — beautiful mountain and valley on the eastern slopes of the Richmond Range, between Grafton and Casino. Very isolated, difficult access in the wet. Approx 1000 acres forested with two rainforest valleys and 238 acres cleared land. Already 14 shareholders are establishing their homes, including two young families with young children. Correspondence or own school envisaged in the future. Property watered by permanent creek and community dam, with sites for future large dams. Average rainfall 55 inches (this dropped to 27 inches in the drought). Normal year has dry winter and wet season from November to April. Abundant native flora and fauna. No prejudices, open-minded people. Objectives — a good, happy life, with lots of fun. Live and let live. Everybody is welcome. Price $3750 per adult share.

Please write to Mookima People, PO Box 21, Rappville, NSW, 2470 for more information.

Shares available in 107 acres Roseberry Creek, 25 miles north-west of Kyogle, northern NSW. We would like people ready to move onto the land, who tend towards vegetarianism and lead a healthy, energetic life. Children especially welcome. Land has northerly aspect and is heavily timbered. There are about 40 acres of tree-studded pasture for horses (and the wallabies). Frost-free orchards and gardens are under development. Long frontage to Roseberry Creek and spring give unlimited water for irrigation and hydro power. Shares are $14,000, one-seventh of this remaining in community account for roads, dams and communal buildings.

Please contact Gary McIntosh, Skylight, Roseberry Creek Road, Kyogle, NSW, 2474. Phone: (066) 36 4104.

For sale. The Permaculture Institute at Stanley, north west Tasmania, is to sell a parcel of 78 acres of coastal land; 3 bedroom house and ¼ acre house block.

The property has three large dams, several ponds, 3000 windbreak trees planted, 200 native trees, 20 fruit and nut trees, swamp-and-pasture land. Sale to ethical, co-operative family or group wanted; not suited to cattle. Supportive community in town.

Permaculture Institute, PO Box 96, Stanley, Tasmania, 7331 for details.

North moves south. Young couple from Sweden (37 & 35) with three-year-old daughter wish to rent or share house in north-west Sydney (Wisemans Ferry-Windsor-West Pennant Hills-Berowra). Both of us work with mentally-handicapped people (as a gardener and handcraft instructor).

Kees van Baalen, C/- Patrick Mcdonald, Warrah Village, Dural, NSW, 2158. Phone: (02) 651 2411.

Couple planning to abandon the rat-race, with one cat and no children, are seeking to purchase a place of our own or willing to consider partnership. Prefer hilly to undulating with permanent creek or dams, no improvements necessary.

Write: Jim & Maureen Lombard, PO Box 251(S), Sutherland, NSW, 2232.

We are a young family who have recently arrived back in Australia after a few years in north Germany. We would like to meet people who are interested in starting a 'small' co-operative community in Victoria.

Contact: Family McNamara, 'Carwoola', Connelleys Creek Road, Acheron, via Alexander, Victoria, 3714. Phone: (057) 72 1507.

Lillifield Community is in the beautiful triangle of Nimbin (11km), Kyogle (21km) and Murwillumbah (45km). The highest point is almost 1000ft above sea level. The basic framework has already been established with roads, homesites, communal areas, etc. Now all that is needed to make this beautiful area grow is approximately 30 members who will each be entitled to five acres (two hectares) for his/her own use and will share in about 100 acres of common land used for recreational and agricultural purposes. Cost to inaugural member for each entitlement is $10,500.

Our aim is for a community of people who will respect this land as well as each other. There is a choice of gentle slopes, flatland, highland and valleys with creeks, streams and natural pools.

If this lifestyle appeals to you, please write to Lillifield Community, C/o PO Box 770, Lismore, NSW, 2480, or phone (066) 89 7224 or (066) 89 9231.

GOAT LINE

Sell, available early December, Angora starter kit — one registered pure bred buck and three (approximately) does. Price $250 the lot.

D. Rasmussen, 509 Stoney Camp Road, Greenbank, Qld, 4124. Phone: (07) 297 5082, evenings.

Maryborough District, Queensland. Share for sale in Utopia Environmental Reserve Pty Ltd, property owned by 20 shareholders on 1300 acres, established 1974. Share includes 10 acres for private use with unusual mudbrick and timber house with solar power, combustion stove, HWS, stained glass windows, all-weather verandah. Set in one acre of tropical garden with 100 bearing fruit trees and ornamentals. Two acres good fencing, large workshed, animal enclosures, old Jeep, all irrigation connected. Magnificent views in three directions, beautiful creek adjacent to National Park and State Forest. Price $33,000, terms available,

E. Corcilius, C/- PO Brooweena, Qld, 4620.

I will be travelling north from Sydney from about December 12 until January 5 and might go as far as the Queensland border. I would love to visit your commune or community and exchange my work (at whatever needs doing) and energies for a space for my sleeping bag and a chance to experience an alternative lifestyle. I have just done a course on mudbrick making at Earthworks and am soon to do one on solar energy. I feel inspired to investigate further. In Sydney I teach English to migrants, make animated films and dream about going north.

I'd really be pleased if you wrote. Debbie Glasser, 118 Windsor Street, Paddington, NSW, 2021.

For sale: Queensland, contemporary style handmade mudbrick house on 23 acres, ½ hour Bundaberg, 10 mins Gin Gin. Two bedrooms, verandahs all around, polished timber floors, silky oak cupboards. Full amenities, power, phone, school bus, daily mail run. Two dams, three bores, permanent water holes, 10,000 gallon rainwater tanks, horse yards, garage and workshop. Mature fruit trees, vegetables, extensive landscaped gardens, natural wildlife.This property could be subdivided. Price $88,000.

Phone (071) 77 4129. Sandra & Doug Steindl, "Hermit's Rest", MS 368, Gin Gin, Qld, 4671.

An additional shareholder wanted for a 420 acre property in the hills 50km from Wingham, NSW. Of the five existing shareholders, there are three families. A substantially forested area with one-third of the land cleared and plenty of permanent water and river flats.

Write Lucas, C/- PO Elands, NSW, 2429. Phone (065) 50 4552.

For sale: Two frost free properties (approx 5ha and 6ha) on Sunshine Coast, close to schools, shops and rail. Suit people interested in self-sufficient type lifestyle.

Send SAE to Max Lindegger, Permaculture Consultancy, 56 Isabella Avenue, Nambour, Qld, 4560.

Wallabadah, NSW, 15 acres bush block adjoining New England Highway. Easy access, 3km to nearest town. Building site on prepared hilltop. Some bricks, 25ft caravan accommodation. Price $30,000.

Reply to J. van der Boon, PO Box 8, Wallabadah, NSW, 2343.

Land wanted, small acreage with or without dwelling, western district of Victoria preferred. Must have all-weather access. Electricity and fencing not essential. Will consider any reasonably priced property, will travel. All replies treated confidentially.

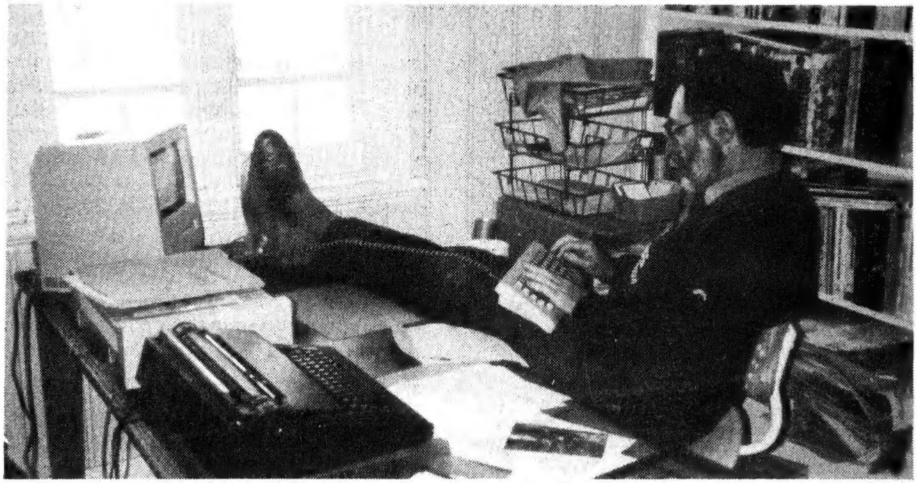
Vic & Jane McNulty, Dewings Road, Gerangamete, via Birregurra, Victoria, 3243. Phone: (052) 36 6240.

Dear friends,

Here's **Earth Garden 44,** our last issue for this year, so for most of you it's time to resubscribe for 1985.

Because of increased production costs the cover price of each issue will edge up to $2.75 per copy, starting with EG45 next February (still good value these days!), a total of $11.00 for the year. That's what you will have to pay at the newsagents, but as an incentive to subscribe, we are offering the four issues, posted to you, at the old price of $10.00 for payments received by December 31, 1984. A good reason to post off your subscription before you forget because we have not put separate reminder slips in this issue like the blue and pink ones of past years. Subs we get after this date will be charged $11.00, but this will still be post-free (despite another postage price rise due soon).

Thanks to everyone who has already paid for their 1985 issues. We value your faith in us — **subscribers are sustainers!** A gift subscription to **Earth Garden** is a nice thought for friends, who will be reminded of your friendship four times a year.



Laid-back! Keith with new Apple *Macintosh*.

Our stock of back issues is running low, but we still have full sets available at the sale price of $50 for EG1 to EG36, $70 for EG1-EG44.

Well, 1984 wasn't too bad after all! We wish all our readers a happy, healthy 1985, free of bushfires, floods and cyclones.

Peace & love,
Irene & Keith

BOOKS & BACK COPIES

EARTH GARDEN, PO Box 378, Epping, NSW, Australia, 2121
Prices include postage within Australia.

BOOKS
HARD TIMES HANDBOOK — $7.50 .... $..........
The Settler's Guide — $15.95 .... $..........
The Essential Earth Garden — $15.95 .... $..........
Illustrated EG Herbal — $9.00 .... $..........
The First Earth Garden Book — $10.95 .... $..........
The Third Earth Garden Book — $10.95 .... $..........
MAGAZINES
1985: EG45-EG48 — $11.00 .... $..........
1984: EG41-EG44 — $10.00 .... $..........
Sale set: EG1-EG36 — $50.00 .... $..........
The lot: EG1-EG48 — $91.00 .... $..........
Single issues: EG45-EG48 — $2.75 each .... $..........
EG33-EG44 — $2.50 each .... $..........
EG26-EG32 — $2.25 each .... $..........
EG1-EG21 & EG24 — $2.00 each .... $..........
EG22-3 & EG25 (Access) — $2.50 each .... $..........
Name ....
Address ....
.... **Postcode** ....

No need to cut this page, just send us the details in a letter if you prefer.

1985 SUBSCRIPTION

Please accept my subscription for the four quarterly issues of Earth Garden for 1985 (EG45-EG48) including postage:
☐ **$10.00 — for payment received by December 31, 1984.**
☐ **$11.00 — for payment after January 1, 1985.**
Name ....
Address ....
.... **Postcode** ....

Back copies

EG1: Move out ... food co-op ... earthworms ... Kibbutz & Moshav ... herbs ... access key ... Fred Robinson ... bean sprouts ... Montsalvat ... organic growing ... comfrey.

EG2: Organic farm ... start a garden ... Neil Douglas the garden artist ... Kiewa farms ... keyline system ... drying and storing food ... hydroponics ... compost garbage ... nutrition.

EG3: Herbs ... making compost ... fast fertilizer ... all about goats ... companion plants ... mudbricks with Neil & Abbie ... water wheel ... domes ... salads ... bread ... pottery ... spinning ... vegies.

EG4: A pleasant treatise on the honey bee ... working bees ... sources ... back to the land in Tasmania ... the transition ... black sheep cycle ... tanning ... candles ... bread ... domes ... donkeys ... wall hanging.

EG5: The wind — windmills ... windpumps ... generators ... raku pottery ... Cinva ram ... keeping poultry ... Hamburghs ... moon planting ... vegan way ... fallout shelter ... just 9 acres ... garden tools.

EG6: Solar 1 — sun cults ... solar cooker ... sundials ... the lost world ... Clifton Pugh ... concrete house ... Shalom ... Cajun cookin ... animal care ... horses ... spirit of Nimbin.

EG7: Solar 2 — hot water ... solar ideas and sources ... good company ... Angora goats ... make a leather bag and belt ... survival skills ... mushrooms ... natural dyes ... mudbricks again ... flight from the city.

EG8: Gas power — methane digester ... power from the pig pen ... by truck to Tassie ... just ¼ acre ... cumbungi hats ... Harmony Farm ... inkle loom ... tapers ... country cottages ... a frame ... school gardens ... sourdough.

EG9: Alternatives to petrol — LP gas ... Mary's place ... building with stone rubble ... oats ... ducks ... macrobiotics ... horse and cats ... rug frame ... natural farming ... how to kill a pig.

EG10: Granite house ... bamboo flutes ... geese ... chip heater ... make beehives ... mudbricks yet again ... Jarrah shingles ... methane ... Bio-dynamics ... tandem ... seaweed ... index (EG 1-9).

EG11: Water — hydraulic ram ... water wheels ... miller's tale ... okra ... seed primer ... heavy horses in Quebec ... tomatoes ... soft technology ... start with hens ... wine ... hard cheese.

EG12: Keeping food ... drying ... salting ... bottling ... storing ... meditating ... tahu ... tobacco ... tropic delights ... plant propagation ... plans for a solar water heater (part 1) ... solar stills ... solar cooker ... Moora Moora.

EG13: The bush — men with axes ... woodchips ... native garden ... flora & fauna ... national parks ... wild places ... wildlife ... bushcraft ... solar hot water plans (part 2) ... straw & paper garden ... producer gas ... Jerusalem artichokes.

EG14: Self-sufficiency — gardens for all ... Botobolar vineyard ... Abbie's goats ... Terania Creek ... millet ... Crusoe ... Thoreau at Walden ... Helen & Scott Nearing ... healthy soil ... we built in stone.

EG15: A Lytel Herbal — growing and using herbs with text and illustrations from the classic 16th century herbals with modern commentary ... companion herbs ... herb sources & books ... index to EG15.

EG16: A Lytel Herbal (Part II) — comfrey ... lavender ... wormwood, yarrow ... people & the land ... poultry shed ... Moora Moora ... peafowl ... goat notes ... basic beekeeping ... building in pise (rammed earth) ... miracle pump.

EG17: All about fencing ... dry stone walls ... make nets ... your own soap ... Autonomous house ... pole shelter ... breeding black sheep ... owner-builders ... asparagus ... Aeolian harp ... Khaki Campbells ... D for duck.

EG18: Fruit garden — oranges ... lemons ... olives ... nuts ... tropical fruit ... fodder trees ... built a road ... homebirth ... wood-fired pottery kiln ... Cinva-ram cottage ... earthworms ... hulling sunflower seeds.

EG19: Wood heat — pot bellies ... Jotul ... cooking ... making a quid ... build a storage cellar ... bushfires ... Sunrise Farm ... stonefruit ... macadamias ... budding ... binding your EG collection ... tree planting.

EG20: Apples ... pears ... cordon & espalier ... avocado ... the Zolins ... pollen ... build a haybale pig house ... love your cow ... rose hips ... the mudbrick flats ... solar homes ... gourds ... preserve fence posts.

EG21: Womancraft — all articles by women ... settling down ... earthly arts (interview with Abbie Heathcote) ... axewomanship ... glove puppets ... joy of spinning ... time to weave ... easy rugs ... lambing ... Sumatran house ... mudbrick weekends ... the group ... old roses ... index (EG10-20).

EG22-23: Australian Access 150 page sourcebook — Aborigines ... organic food growing ... permaculture ... Bill Mollison ... earth building ... wind ... solar ... water power ... solar cells ... water supply ... bucket pump ... with access to groups, books, tools and techniques ... small scale technology.

EG24: Place — 24 groups and new settlers share their place outside the cities ... including Mare Carter ... Ron Edwards ... Neil Douglas ... Gundaroo Store ... Rainbow Region ... Universal Brotherhood ... Mt Oak ... Moora Moora ... bush ashram ... desert oasis, cold winters ... personal stories from 20th century pioneers.

EG25: Australian Access 2 — 130 page sourcebook — livestock ... acquaculture ... fencing ... wombat gates ... killing ... tanning ... food and nutrition ... Dorothy Hall ... a year's supply of food ... grain grinders ... mincers ... methane basics ... wind generator ... low energy solar homes ... greenhouse ... more tools & techniques.

EG26: Colour spread on the earth-built kasbahs of Morocco ... owner-builders report on homes of stone, timber and mudbricks ... build a slab cottage ... tree felling ... two solar-electric homes ... Earth Garden survey ... survival vineyard ... acorns ... fruit without poisons ... compost dunny ... home-made gas ... quandong ... pumpkin recipes.

EG27: Plants we eat — 100 tropical food plants for Australia (part 1) ... plant protein ... 16 legumes to grow & eat ... like winged bean ... pigeon pea ... lablab bean ... cowpea ... sword bean ... chickpea ... sugar pea ... mung bean ... soybean ... adzuki bean ... life-raft ... blacksmithing ... bluestone building ... mudbrick solar home ... wok cookery ... choko ... homebirth.

EG28: Animal stories — by packhorse through the Victorian Alps ... horse & buggy ... Mary's black sheep ... the woolly Merino ... Timbertown bullocky ... tropical food plants for Australia (part 2) ... stringybark baskets ... tamarillo ... buying bees ... solar trike & fan ... make a poker ... persimmon ... seed patents.

EG29: Mudbrick building primer — the monastery at Stroud ... six builders & their mudbrick experiences ... mud barbecue ... Bob's bonza brickmaker ... earth floors ... curved walls ... herbs on the roof (sod it!) ... low energy design ... the cutting axe ... food plants for tropical Australia (part 3) ... coconut mats ... mango mania.

EG30: Organic growing guide ... the organic idea ... food without poisons ... making compost in heaps, pits, trenches, boxes, bins & barrels ... carpet the garden ... wot no digging? (mulch it instead!) ... organic methods for the semi-arid West ... compact growing boxes ... a traditional farmer ... preserving figs ... tasty tempeh ... the Bornhoffen story ... pasta ... glass bottle mosaics ... two trickle watering systems ... cool kitchens ... macrobiotic bakery.

EG31: Energy alternatives at work — make your own hydraulic ram ... second-hand windpump ... yacht wind-generator ... mudbrick sequels ... freezing food ... blanching ... choosing a freezer ... zucchini glut ... drying fruit ... all about sprouts ... fireless cookers (hot boxes and baskets) ... camp oven ... growing greens in the wet ... building a log house (part 1) ... index (EG 21-EG30).

EG32: Trees — tribute to trees ... St Barbe Baker tree tales ... how a tree works ... the miracle of a leaf ... native trees from seed ... trees on the farm (interview with Tim Cox) ... forestry directory ... dieback ... renewing the land ... coppicing ... the woodchipper blade ... value of trees ... artist in the bush (interview with Neil Douglas) ... low cost country home building ... earth building books ... cob does the job ... building a log house (part 2) ... square foot gardening.

EG33: Tenth anniversary issue ... uses of wood ... timber felling ... lifting poles ... post-and-beam design ... building a log house (part 3, concludes) ... parquet floors ... backyarders' livestock ... goats ... rabbits ... fowls ... portable hen-house ... dandelions ... wild tea party ... bush regeneration ... planning figs ... dry pit loo ... blackberry-eating beetle ... weeding tools ... catchment philosophy ... seed supplies.

EG34: A look at China (extra colour photos) — the commune system ... teaching the masses ... trees of friendship ... forestry ... fish farming ... recycling human wastes ... biogas ... transport ... travel notes ... Ron Edwards writes on earth building the Chinese way (and tea) ... making the farm pay ... places ... bread & jam ... what to do in the Year of the Tree ... rainforest ... eco-gardening.

EG35: Bees and trees — Tributes to Richard St Barbe Baker ... tree tales ... backyard bees ... hiving a swarm ... St Barbe's bees ... a beginner's kit ... beekeeping books, equipment, clubs and information ... nectar-yielding eucalypts ... self build housing ... mudbrick workshop ... earth wall footings ... make your own solar collector ... a good workdog ... magpies ... wormiculture ... nuclear nightmare ... waste to compost ... dig for victory ... fodder trees.

EG36: Settling in at Nimbin — glimpses of Nimbin ... settler's tales ... interview with a woman builder ... handbuilt homes ... a pawpaw plantation ... birth & beyond ... plug in the sun — simple, cheap, solar electric systems ... passive solar 'rules of thumb' ... biological building ... farm structures ... a potty garden ... choughs ... bush birds ... the inn at Ollantaytamboo, Peru ... more fodder trees ... regreening at Young ... make a lavender sachet ... the food page ... nuclear-free Australia? ... More!

EG37: Hard times — sidestepping the recession ... new paper from old ... newspaper fuel ... rags to rugs ... barter ... when the lights go out ... slush lamps ... sawdust stove ... tin can cooker ... the hungry 30s ... Depression dodges ... Happy Valley humpies ... hand grain mills ... 120 money saving hints ... make soap ... whitewash ... polishes ... cleansers ... glue ... insect repellents ... table of raw materials ... passive solar design ... roof ponds ... solar cell update ... donkeys at work ...

EG38: Access survey — where to buy alternative energy equipment ... electric grain grinders ... Hard Times tucker ... back to basic bread ... Batch baking ... steam cooking ... sustaining soups ... no-meat meals ... solar dried bananas ... yoghurt ... summer cheese ... cheap meat meals ... home brewed beer ... coffee from tree to cup ... a Gujarati village ... Noel's Island ... Wild Country Park ... Depression days ... small farm equipment ... earth walls and bushfires ... mudbrick hermitage ... owner-builder problems ... the electromagnetic house (building biology) ... Self-Build success ... Hondas on the farm ... sweet cherries ... winter in the vineyard ... more!

EG39: Alternative technology — low-voltage small-scale ... run lights and TV from your car battery ... Peter Pedal's bicycle wheel wind generator ... farm energy system ... fire without matches ... change AC to DC ... bushfire defensive house ... earth building notes ... a reply on mudbricks ... the indoor climate (building biology) ... backyard food growing ... intensive plot ... a sense of humus ... try herbs ... rosehips ... avocado growing guide ... laying out a farm ... protecting trees ... the vineyard in spring ... dairy notes, 1898 ... tasty tomato recipes ... herb teas ... recycling containers ... bread happiness ... old-time household hints ... changing lifestyles ... access ...

EG40: Communities — "constructive alternatives" . . . Communiversity . . . village in the making . . . start a food co-op . . . making the co-op work . . . three in a caravan . . . Scott Nearing — a good life . . . how we make cyder in Tasmania . . . trees for fire protection . . . tree planting at Undalya . . . the self-built house . . . extracts from The Muddies Manual . . . raw earth . . . earth floors . . . bushfire resistant housing . . . boiling the billy . . . hares . . . tetanus . . . laying out a farm (part 2) . . . olive oil . . . cashew nuts

EG41: Wandering — across the Sahara ... Uganda ... in Australia with pack donkeys & by horse float ... the lure of Timbuktu ... adventure travel access ... Sahara mat-tents ... Moora Moora 10 years on ... build a Savonius rotor bike wheel wind generator (Peter Pedals) ... energy access ... yeastless breads ... dampers ... build a shadehouse ... food co-op books ... recipes for real potatoes ... sheep stories ... index to Earth Garden issues 31-40.

EG42: Building — earth-covered housing ... the Burra dugouts ... our stone home ... slipform technique ... flood defensive house ... build a Chinese pigsty ... earth architecture conference ... mudbrick notes ... compost power (methods of Jean Pain) ... tomato tips and treatment ... gardening on the move ... herbal insecticides ... worthy concepts ... deep ecology (We are the rocks dancing) ... Earth Garden reader survey ... healthy goats ... breakin' in the Fergy ... pay your way ... Botanic Ark ... earth travel ... the Tuareg ... people and places ... bourgeois communes!

EG43: Earth domes & vaults the pink palace at Eukey . . . rendering earth walls . . . mudbrick building . . . bush stone masonry . . . farm systems . . . the bush shower . . . Peter Pedal's Dynohub Pelton Wheel & Incinerator hot water . . . remote power systems . . . low voltage wiring . . . sheet metal pans . . . farming with wildlife . . . sheep . . . donkeys . . . horses . . . herbal poultices . . . Daintree blockade . . . Rape of the Solomons . . . travelling with kids . . . no more Mrs Suburbia! . . . energy access.